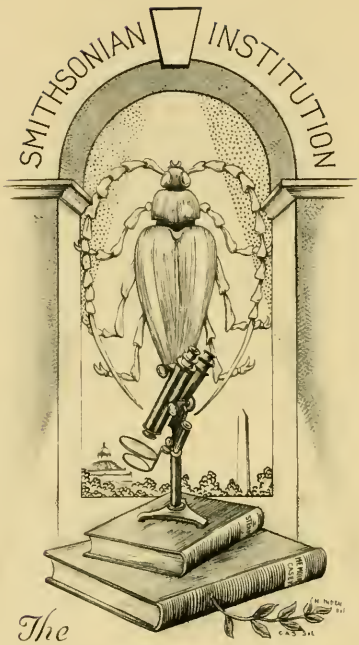

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ERRATA.

Page 152, line 2, for "*instabilis*" read "*stabilis*."

„ x, line 13, for "specimens" read "specimen."

„ 305, line 9, for "ventra" read "ventral."

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1880 Scott, Sir Arthur, Bart., F.L.S., 97 *Eaton-square*, S.W.; and *Great Barr Hall, Birmingham.*
1875 † Sealy, Alfred Forbes, *Cochin, South India.*
1864 Semper, George, *Altona.*

1862 Sharp, David, M.B., *Eccles, Thornhill, Dumfriesshire.*
1847 Shepherd, Edwin.
1852 Sheppard, Edward, F.L.S., 18 *Durham Villas, Kensington*, W.
1867 Sidebotham, Joseph, F.L.S., F.R.A.S., F.S.A., *Erlesdene, Bowdon, Cheshire.*
1877 Slater, John Wm., 36 *Wray-crescent, Tollington Park*, N.
1880 Smith, Miss Emily A. (Assist. State Entomologist of Illinois), *Peoria, Illinois;* and *Care of Dr. R. Leuckart, Leipzig.*
1869 Smith, Henley Grose, *Warnford-court, Throgmorton-st.*, E.C.
* † Spence, William Blundell, *Rome.*
1848 † Stainton, Henry Tibbats, F.R.S., F.L.S., F.G.S., &c., PRESIDENT, *Mountsfield, Lewisham*, S.E.
1862 Stevens, John S., 38 *King-street, Covent Garden*, W.C.
1837 Stevens, Samuel, F.L.S., *Loanda, Beulah Hill, Upper Norwood*, S.E.
1882 Swanzy, Francis, *Stanley House, Granville-road, Sevenoaks.*
1876 Swinton, A. H., *Binfield House, Waterden-road, Guildford.*

1856 Thomson, Jas., 12 *Rue de Presbourg, Place de l'Etoile, Paris.*
1882 Todd, Richard, 5 *Princes-terrace, Bayswater*, W.
1859 † Trimen, Roland, F.L.S. (Curator of South African Museum), *Cape Town, Cape of Good Hope.*

1869 Vaughan, Howard, 11 *Ospringe-road, Brecknock-road*, N.W.
1866 Verrall, G. H., *Sussex Lodge, Newmarket.*

1876 Wakefield, Charles Marcus, F.L.S., *Belmont, Uxbridge.*
1870 Walker, Rev. Francis Augustus, M.A., F.L.S., *Bourne Villa, Bournemouth, Hants.*
1878 S. Walker, J. J., R.N., 12 *Ranelagh-rd., Marine Town, Sheerness.*
1858 Wallace, Alexander, M.D., *Trinity House, Colchester.*
1863 † Wallace, Alfred Russel, F.L.S., F.Z.S., &c., *Nutwood Cottage, Frith Hill, Godalming.*
1866 † Walsingham, Thomas de Grey, Lord, M.A., F.L.S., F.Z.S., &c., *Eaton House, Eaton-square*, S.W.
1866 Ward, Christopher, F.L.S., *Savile-road, Halifax.*
1869 Waterhouse, Charles O., *British Museum*, W.C.
* Waterhouse, George R., F.Z.S., &c., *British Museum*, W.C.
1869 Websdale, C. G., 78 *High-street, Barnstaple.*
1845 Weir, John Jenner, F.L.S., 6 *Haddo Villas, Blackheath*, S.E.
1876 Western, E. Young, 27 *Craven Hill Gardens, Bayswater*, W.
* Westwood, John Obadiah, M.A., F.L.S., &c., Hope Professor of Zoology, *Walton Manor, Oxford.*
1882 Weymer, Gustav, 58 *Kleeblattstrasse, Elberfeld, Rhenish Prussia.*
1868 † White, F. Buchanan, M.D., F.L.S., *Perth*, N.B.
1865 White, Rev. W. Farren, *Stonehouse Vicarage, Gloucestershire,*
1882 Williams, W. J., *Zoological Society, Hanover-square*, W.
1874 Wilson, Owen, *Cwmffrwd, Carmarthen.*
1881 Wood, Theodore, 5 *Selwyn-terrace, Jasper-road, Upper Norwood*, S.E.
1874 Wood-Mason, James, F.G.S., F.L.S. (Curator of the Indian Museum), *Calcutta.*
1862 Wormald, Percy C., 2 *Clifton Villas, Highgate Hill*, N.

1865 S. Young, Morris, *Free Museum, Paisley.*

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THE

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1882.

I. Heterocerous Lepidoptera *collected in Chili by* Thomas Edmonds, Esq. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Read December 7th, 1881.]

Part I.—SPHINGES and BOMBYCES.

Plate I.

A short time since I had the pleasure of bringing before the Entomological Society a paper upon the "Butterflies obtained in Chili by Mr. Edmonds" (Trans. Ent. Soc. Lond., 1881, pp. 449–486); I now proceed to give an account of the moths in his unusually rich series. Numerous valuable notes on the various species have been placed in my hands by him, and are incorporated in the present paper.

Of the *Sphinges* Mr. Edmonds only obtained three species, of which, however, he has observed all the larvæ; of the other groups here enumerated I recognise forty-one species, though I think it quite possible that this number may have to be somewhat modified when the species are reared, and their earlier stages have been carefully noted.

SPHINGIDÆ.

DEILEPHILA, *Ochs.*

1. *Deilephila euphorbiarum.*

Sphinx euphorbiarum, Boisduval, in Guérin and Percheron's 'Insectes,' 2me livr. 8, pl. 3 (1835).
Deilephila spinifascia, Butler, Proc. Zool. Soc., 1871, p. 81.
Deilephila celeno, Boisduval, Sp. Gén. Lép. i. p. 170 (1875).

"Description of larva when half grown:—Head, dorsal line, spiracular line, row of subdorsal spots, under side, legs and claspers, dull crimson; front half of each segment black, with two dull crimson spots in yellow rings (one on each side), hinder half bright green, interrupted by five narrow transverse lines. Horn slender, rough, red at base, black at apex.

"*Var.*—Dull black; head, legs, claspers, and hinder part of last segment, dull crimson; spiracles yellow; each segment with two yellow rings (one on each side), excepting the 12th and 13th, which have yellow streaks instead; within and around the yellow rings are patches of deep shining black.

"*Full-grown* (Plate I., fig. 1).—The black and green markings less distinct, but same pattern as when half-grown. General tint reddish olive, varying in depth; the yellow rings always centred with black.

"Larva found sparingly about Valparaiso, from November to March; feeds on *Muhlenbeckia sagittæfolia*.

"Imago appears to be most common in March."—*T. E.*

2. *Deilephila annei.*

Sphinx annei, Guérin, Mag. de Zool. 2me ser. 1, Ins. pl. 2 (1839).

Larva blackish; head, legs, claspers and horn, dull red; ocelli rounded, uniform, red with yellow inferior margins, connected, as in the preceding species, by a series of yellow dots; lower half of body yellow, a blackish longitudinal subspiracular line interrupted on each segment by a longitudinal red dash. This description is taken from a coloured figure (Plate I., fig. 2).

"Food-plant, *Oxybaptrus parviflorus*. November, December, and January."—*T. E.*

PROTOPARCE, *Burm.*

3. *Protoparce eurylochus.*

Sphinx eurylochus, Philippi, Linnæa Entomologica, xiv. p. 273 (1860).

Sphinx cæstri, Blanchard, in Gay's 'Chili,' Zool. pl. 5, fig. 9 (1854).

Larva apple-green, with seven parallel oblique cream-coloured lateral stripes, the last extending to the base of the horn; these stripes have a blackish external (or superior) edge; spiracles white, with reddish-edged black centres; horn with bluish superior and rosy inferior surface, its tip black; claspers with yellow margins. From a coloured drawing.

"Full-fed larva (Plate I., fig. 3): the surface of the body is clothed with very fine and short yellowish down, invisible, except when very closely examined. Feeds on 'Litre' (*Litrea venenosa*) in January and February.

"Imago in February, March, and April. Appears to be common throughout the country."—*T. E.*

COSSIDÆ.

LANGSDORFIA, *Hübn.*

4. *Langsdorfia valdiviana.*

Cossus? valdivianus, Philippi, Linnæa Entomologica, xiv. p. 291, n. 28 (1860).

Las Zonas.

"Taken at light in January."—*T. E.*

I think it possible that the families *Hepialidæ* and *Psychidæ* ought to be placed here rather than where they are at present located; there is an unquestionable similarity in the neuration of these two families, and that of the *Hepialidæ*, although of a very low type, is hardly more so than that of the *Castniidæ*, to which, excepting in their antennæ, they seem allied. I strongly suspect the natural order to be *Cossidæ*, *Psychidæ*, *Hepialidæ*, *Castniidæ*, judging them apart from the Micro-Lepidoptera, some of which seem allied to *Cossus*.

CASTNIIDÆ.

CASTNIA, *Fabr.*

5. *Castnia eudesmia.*

Castnia eudesmia, G. R. Gray, Trans. Ent. Soc. Lond. ii. p. 145, n. 14 (1837); Blanchard, in Gay's 'Chili,' pl. 5, fig. 8 (1854); Butler, Ill. Typ. Lep. Het. i. p. 3; pl. 1, fig. 2 (1877).

"Common near Valparaiso, but very difficult to capture in the perfect state. The larva feeds in the interior of the stems of a species of *Bromelia*, and the pupa-cases may be found with the ends sticking out of the stems between the leaves in the months of October and November. The cases, or cocoons, vary from 5 inches to 9 or 10 inches in length (the female being largest), are composed of chewed wood of the plant and silk, and are beautifully lined with silk on the inside.* The pupa has the power of wriggling from end to end of the cocoon.

"The imagines emerge end of December and in January, and fly very swiftly by day. The food-plant has long sword-shaped leaves, with sharp hooked prickles on the edges, and bears a stalk 8 or 10 feet high, with pale yellow flowers."—*T. E.*

ZYGÆNIDÆ.

PROCRIS, *Fabr.*

6. *Procris melas.*

Procris melas, Guérin, Mag. de Zool. 2e sér. pl. 11, fig. 3 (1839).

"Appears to be widely distributed, but local. I have taken it near Valparaiso in December and January, and in Valdivia in February. It frequents the bushes of arborescent grass (*Chusquea*), and flies swiftly in the sunshine."—*T. E.*

ARCTIIDÆ.

PARACLES, *Walk.*

This genus is nearly allied to *Antarctia* of Hübner, but is more coarsely scaled, and has coarser and longer hair on the thorax; the antennæ also are apparently longer.

* This fully bears out my view of the affinity of the *Cossidæ* to the *Castniidæ*.

7. *Paracles rudis*, n. s.

♂. Fuliginous-brown; the body darker than the wings, the primaries darker than the secondaries, which are more or less whitish towards the base; antennæ brown, with blackish pectinations; the hair on the abdomen somewhat ochraceous at the sides; wings below whity-brown; pectus clothed with fuliginous and yellowish brown hair; head blackish, with an ochraceous spot on each side at the base of the antennæ; venter greyish brown. Expanse of wings 1 inch 8 lines, or 42 mm.

"Coral; came to light in February."—*T. E.*

This species seems to be allied to *Antarctia severa* of Berg, from Patagonia, but is evidently distinct.

LAORA, *Walk.*

This genus is also allied to *Antarctia*, with which it agrees better in the structure of the male than *Motada* does; the female, however, has the wings aborted somewhat as in *Penthophera* (*Liparidæ*).

8. *Laora latior*, n. s.

Primaries above fuliginous-brown; fringe whitish, traversed by a grey stripe; secondaries white, with brownish veins, the external two-thirds washed with pale greyish brown; fringe tipped with white; body fuliginous-brown; head darker; antennæ white, with black pectinations; collar slightly ochraceous in front; abdomen blackish in the centre, clothed with dark ochreous hair at the sides and base; wings below sordid creamy whitish, or whity-brown; primaries with the costal area slightly brownish; interno-basal area pale ochreous; body below fuliginous-brown; legs darker brown; femora bright ochreous or cadmium-yellow at the sides; tarsi whitish. Expanse of wings 29–31 mm.

♀. Sordid white, or greyish pale brown; abdomen blackish, almost covered by transverse segmental fringes of pale brownish woolly hair, and with whitish anal segment; antennæ black below. Expanse of wings 18–20 mm.; length of body 28 mm.

Valparaiso; eight males, five females.

"Bred from larvæ, resembling those of *Arctia;* head black and shining; body black, with metallic-blue tubercles, and covered with short hairs which are greyish on the 2nd, 3rd, and 4th segments; and on the others reddish brown on the back and grey on the sides. Feeds on various low plants; cocoons of white silk mixed with hairs from body of larva and very thin. Emerges in January and February. It comes to light."

With the above were associated what I must regard as three nearly allied though distinct species; they seem to me to differ too much for mere variation.

9. *Laora tegulata*, n. s.

Less woolly than the preceding species, the primaries less triangular, the secondaries smaller, the tegulæ conspicuously longer (when perfect); primaries above greyish chocolate-colour, the fringe slightly greyer than the body of the wing; secondaries greyish brown, semi-transparent towards the base; thorax chocolate-brown; head darker; antennæ greyish brown; collar with the anterior margin ochraceous; abdomen ochreous, with a longitudinal blackish dorsal band on the posterior half; under surface greyish brown, sericeous, with faint bronzy reflections; anterior femora with a broad cadmium-yellow band; other femora ochraceous at the sides; tibiæ and tarsi dark brown above, greyish brown below. Expanse of wings, 18 mm.

Valparaiso; two males.

10. *Laora angustior*, n. s.

♂. Primaries distinctly narrower than *L. latior*, bronze-brown, the fringe sericeous-grey, almost silvery; secondaries much smaller than in *L. latior*, whity-brown, slightly darker towards the outer margin; fringe grey, tipped with white; thorax rufous-brown; collar slightly ochraceous; antennæ whity-brown, with dark brown pectinations; abdomen stramineous or ochreous, without dorsal stripe; under surface pale greyish brown, fringes silvery grey, tipped with white; interno-basal areas whitish; legs slightly darker; femora almost wholly ochreous; knees blackish. Expanse of wings, 30 mm.

♀. Uniformly whity-brown. Expanse of wings, 22 mm.

Valparaiso; four males and one female.

Some males are darker throughout than the type, the fringe of the primaries being less sericeous, and the abdomen ochreous instead of stramineous.

11. *Laora obscura*, n. s.

♂. Primaries above greyish fuliginous, fringe grey; wings as wide as in *L. latior*, but apparently with longer costal margin; secondaries pale greyish brown; body dark greyish fuliginous, the head almost black; antennæ white, with blackish pectinations; abdomen with a few ochreous hairs on the sides of the last three segments; wings below uniformly pale grey; body below dark greyish brown; anterior femora with a lateral ochraceous stripe; a few ochraceous hairs close to the base of the wings; tibiæ and tarsi blackish above. Expanse of wings, 32 mm.

Valparaiso; one male.

This is more distinct than the three preceding, and therefore, although there is only one example in the collection, I do not hesitate to regard it as a separate species; had the whole of the specimens of *Laora* been reared from one batch of larvæ it would perhaps have been impossible to doubt that they were referable to one variable species, the individuals of which were not only inconstant in coloration, but in the form and relative size of their wings; since, however, Mr. Edmonds' note makes it evident that some at least were taken at light, there is no necessity for me to arrive at such an improbable conclusion respecting them. It is possible that Berg's Patagonian *Bombyx ? deserticola*, subsequently referred by its describer to *Ocnogyna*, may be a more specialized form of the genus *Laora*.

LIPARIDÆ.

PORTHETRIA, *Hübn.*

12. *Porthetria hypoleuca.*

♀. *Bombyx ? hypoleuca*, Philippi, Linnæa Entomologica, xiv. p. 287, n. 23 (1860).

♂. Smaller than female; primaries dark piceous, shading towards the base into ferruginous and crossed by black lines as in the female; secondaries mahogany-red, becoming gradually blackish towards outer margin;

fringe rufous-brown; thorax smoky brown, reddish beneath the surface-scales; a few greyish scales towards the front; head whitish; antennæ blackish; abdomen foxy red; wings below foxy red, shading into piceous towards the apices (this colour extending over the apical half of the primaries); body below sandy brownish, slightly fuliginous in front. Expanse of wings, 1 inch 7 lines.

PSYCHIDÆ.

Acousmaticus, n. g.

Aspect of *Psyche*, but the antennæ formed as in *Penthophera*, although considerably larger and of about three-fourths the length of the primaries, broadly pectinated on both sides, the pectinations deflexed; a woolly projecting tuft between the eyes; palpi long, slender, angulated, and deflexed; wings semitransparent, the cells (especially that of the secondaries) short; veins radiating; primaries elongate-triangular, the angles rounded off; cell of primaries enclosing two smaller cells formed by recurrent veins from the disco-cellulars, which are united behind; submedian not looped, but dividing at basal third into two closely-approximated branches which run to external angle; secondaries rather small, oval, the costal border convex to beyond the middle and thence slightly concave to apex; no true costal vein, its place being occupied by the subcostal which terminates in three parallel approximated branches; disco-cellulars acutely inangled with recurrent veins nearly as in the primaries; median vein four-branched; legs long and rather slender.

13. *Acousmaticus magnicornis*, n. s.

Fuliginous-brown, thorax and wing-veins darker; primaries and dorsal surface of abdomen darker than the secondaries and the sides of the abdomen; antennæ black; wings below greyish, sericeous; primaries with a pale spot at the extremity of the discoidal cell; body below whity-brown, the tarsi slenderly banded with grey; the pectus clothed with fuliginous hairs. Expanse of wings, 10 lines.

This very remarkable little species must certainly belong to the *Psychidæ*, with which it agrees in the general plan of its neuration.

THANATOPSYCHE, n. g.

Aspect and coloration of *Thyridopteryx*, but with entirely different neuration; primaries with the costal vein extending to second third of the costal margin; subcostal emitting its first two branches just before the end of the cell which projects forwards at its anterior angle, considerably in advance of its posterior angle; third subcostal branch emitted from the anterior angle, forking just before the middle and emitting the upper radial from its inferior edge, close to its origin; lower radial emitted near to the third subcostal, thus reducing the upper disco-cellular to about half a millimetre in length; lower disco-cellular long and inangled, with scarcely a trace of the usual recurrent spur; median four-branched, the third branch being forked from its basal third; submedian with short recurrent spur at external third; secondaries with powerful frenum and several short stiff basal bristles; no costal vein, its place being occupied by the subcostal, which is arched, and forks just before apex; cell large and broad, projecting farther behind than in front, partly divided by two short recurrent spurs, the first from an acute angle near the commencement of the upper disco-cellular, the other from the radial which separates the oblique line of the disco-cellulars in the middle; median vein four-branched, the third branch being forked from just above the middle, the branches all divergent so that the first branch converges towards the submedian; antennæ tapering, pectinated to the tips; body densely clothed with long hair; genitalia prominent and exposed; femora woolly, sericeous; tibiæ and tarsi slender.

Pupa-case elongate-fusiform, of densely-woven silk mixed with small wooden chips, which give it a spotted appearance, and just below the middle ornamented with a zone of short projecting sticks.

14. *Thanatopsyche canescens*, n. s. (Plate I., figs. 4, 4 *a*).

Allied to *Psyche chilensis* of Philippi, with which I at first identified it, but differing, according to Mr. Edmonds, in its smaller size and the paler colouring of the thorax. Black; wings semitransparent, with black veins and margins; head and antennæ black, thorax clothed with sericeous straggling grey hairs; abdomen

black; genitalia castaneous. Expanse of wings, 22 mm.

"Larvæ feed in case on 'Quilo' (*Muhlenbeckia sagittæfolia*) and other shrubs during the first half of the summer, and perfect insects emerge in March and April."

"This is not the *Psyche chilensis* of Reed: the latter is a larger insect, of the same genus, having the thorax clothed with black instead of grey hairs. I hope to receive specimens before long."—*T. E.*

As we only had the species figured, it would have been impossible to regard it as distinct from Philippi's insect without the above note; for though the description says—"Der Kopf, die ganze Brust, Schenkel und Schienen sind tief schwarz," it adds "und sehr dicht mit langen und sehr feinen weichen Haaren bekleidet," without stating that these long and fine hairs are also black, as Mr. Edmonds assures me they are. Dr. Philippi's description of the pupa-case would also answer equally well for that of *T. canescens*, which is also of about the consistency of parchment, and armed with small projecting bits of stick in a zone near the middle and towards the base.

LASIOCAMPIDÆ.

Macromphalia, *Felder*.

15. *Macromphalia nitida*, n. s.

Primaries dark shining cupreous-brown; the two ordinary lines representing the central belt barely distinguishable, excepting on the costal border, where they are represented by a few white scales; the externo-discal lunulated line represented by a slightly-irregular series of grey-bordered black lunules; a few grey scales upon the fringe; secondaries bright coppery-chocolate, slightly darker along the outer margin; a slight sprinkling of greyish scales on the fringe; thorax shining, dark cupreous-brown inclining to piceous, and sprinkled with grey hairs; antennæ testaceous; abdomen at the base coloured like the thorax, but becoming paler towards the anal extremity; wings below of a uniform cupreous-brown colour, sericeous, a few grey scales sprinkled along the costal borders and on the fringes; body below pale sandy-brown, varied by a few white hairs; anterior femora with an ochreous spot below with

a broad fringe of delicate snow-white hair. Expanse of wings, 37 mm.

♀. Whity-brown; primaries above irrorated with black and grey, and crossed by indistinct black irregular lines almost as in *M. dedecora;* the general aspect, however, is nearer to that of the female of *Porthetria hypoleuca*, but the primaries are darker and the markings confused; below, the wings are crossed by two arched grey-brown stripes, one discal, the other submarginal; the primaries as above are darker than the secondaries, which are of a greyish whity-brown colour; the body on both surfaces is also of this colour. Expanse of wings, 48 mm.

The male was bred at the end of November; its general coloration is shining chocolate, but the primaries and thorax have a distinctly greyish appearance.

16. *Macromphalia dedecora.*

♂? *Bombyx ancilla*, Philippi, Linnæa Entomologica, xiv. p. 289, n. 25 (1860).

♀. *Bombyx dedecora*, Feisthamel, Mag. de Zool., 2e sér. pl. 23, fig. 2 (1839)

Valparaiso; in August.

The male was "bred from larva found feeding on a garden *Pinus;* feeds also on 'Quilo' in May. Brown and hairy, a double row of long pencil-like tufts of black hair along the back; cocoon similar in shape and texture to that of the 'Drinker' (*Odonestis potatoria*)." —*T. E.*

17. *Macromphalia chilensis.*

Macromphalia chilensis, Felder, Reise. der Nov. Lep. 4, pl. lxxxiii. fig. 23 ♂; pl. lxxxiv. fig. 12 ♀ (1874).

Valdivia.

"Bred from larva; hairy, greyish brown, with double row of long thin black pencil-like tufts along the back; head black, with yellow ∧-shaped mark on face; underside and claspers reddish. Emerged beginning of April." —*T. E.*

18. *Macromphalia rubrogrisea.*

♂. *Bombyx? Catocephala rubrogrisea*, Philippi, Linnæa Entomologica xiv. p. 288, n. 24 (1860).

♀? *Bombyx? rustica*, Philippi, *l. c.*, p. 290, n. 26 (1860).

One female; "Las Zonas, at light."—*T. E.*

I was at first inclined to think, with Mr. Edmonds, that this insect was the female of No. 216 (regarded in the present paper as the male of *M. dedecora*); but it agrees so much more closely with the male insect described by Philippi under the name of *Bombyx? rubrogrisea* that I have concluded that it is that species; it also comes rather near to the description of *B. rustica*, which I should judge to be taken from a worn example.

19. *Macromphalia rivularis*, n. s.*

Primaries above granite-grey, with the ordinary lines snow-white, of the usual form, those representing the central band undulated, those representing the submarginal line forming a partially double series of more or less lunate dashes (probably the pale borders of the usual submarginal blackish lunules); a black discocellular spot; secondaries pale greyish brown, fringe speckled with white scales; thorax granite-grey; antennæ whitish, with rust-red pectinations; abdomen pale greyish brown; under surface pearly grey; primaries with brownish costal and whitish interno-basal area; some snow-white spots on the costal border beyond the middle, indicating the commencement of the outer white line and submarginal lunules of the upper surface; costal area of secondaries crossed in the middle by two abbreviated pale brown stripes. Expanse of wings, 36 mm.

One male.

20. *Macromphalia purissima*, n. s.

♂. Snow-white, the basal half of primaries, the whole of the secondaries, and the body, sericeous; primaries above with the inner line abbreviated, only

* To this species was attached a label, "*Bombyx affinis*," Feisth., but it is not at all like that insect, which has bright red-brown secondaries, like the male of *Porthetria hypoleuca*.

represented by a short brown costal dash, outer line well-defined brown, excepting on costal border, where it is black and zigzag; submarginal series of lunules ill-defined, but black, and commencing upon the costa with a transverse oblong black dash, placed a little farther from the margin than the series itself; a conspicuous black spot at the end of the cell; secondaries with a small dark brown pencil of hair at the end of the cell; antennæ with testaceous pectinations; thorax slightly sordid in front; under surface snow-white, primaries with the costal margin irrorated with black; subcostal area occupied by a red-brown streak extending almost to the subapical oblong costal dash, from which it is separated by a narrow white stripe; from the end of this brown streak an oblique line crosses the wing to the inner margin, thus limiting the basal two-thirds, which is more or less suffused between the veins with brown scales; beyond the oblique line the interspaces are greyish up to the submarginal series of spots, which are placed as above, but are more distinct and red-brown; secondaries with two minute closely-approximated black dots at the end of the cell; a few brown scales in a transverse line beyond the cell; collar below black; tarsi brown, fringed with long hair. Expanse of wings, 44 mm.

♀. Primaries above pale creamy buff; an oblique black spot at the end of the cell; outer (or discal) brown line slender, zigzag; subapical costal spot ill-formed, brown; submarginal spots reduced so as to form a very slender slightly-irregular interrupted brown line; secondaries snow-white, with cream-coloured fringe; a brown spot at the end of the cell; a pale reddish brown spot at anal third of abdominal border, and two submarginal dashes of the same colour towards the anal angle; body cream-coloured on both surfaces; wings below white, washed with cream-colour on the costal areas; primaries with a dusky spot at the end of the cell, a second smaller and lunate spot at apical third of costa, and an apical submarginal streak; no other markings: tarsi brown, anus clay-red. Expanse of wings, 66 mm.

A pair.

Allied to this species is a male *Macromphalia*, taken by Miss Mann at Valparaiso, and obtained for our

collection in 1880: in all its important characters it agrees with the original figure of *M. affinis* in Guérin's 'Magazin de Zoologie'; but the ground colour of the primaries and the thorax are chalky-white, sparsely irrorated with brown, whereas in the figure they are represented as almost wholly brown: that the latter coloration is incorrect (notwithstanding that Blanchard has exaggerated it) is shown by Feisthamel's description, which says—"Le dessus des premières ailes d'un gris blanc"; and again, "Le corselet est du mème ton que les ailes supérieures"; so that there can be no question that the example obtained by us is the true *M. affinis*, and consequently that the insect identified with the latter in Chili, and here named by me *M. rivularis*, is a perfectly distinct and new species.

Ormiscodes, *Blanch.*

21. *Ormiscodes socialis.*

♀. *Bombyx socialis*, Feisthamel, Mag. de Zool. 2e sér. pl. 22, fig. 1 (1839).

Catocephala socialis, Blanchard, in Gay's 'Chili,' Zool. 7, p. 63, n. 1 (1854).

Dirphia angulifera, Walker, Cat. Lep. Het. 6, p. 1363, n. 23 (1855).

Four pairs.

The male is smaller than the female, has more red on the secondaries, and the antennæ broadly pectinated; the ground colour varies considerably.

"Description of larva. Full-fed, 1½ inches long; above beautiful pale green; beneath pale red in many specimens, in others green; a spiracular line, prominent and pearly-white, edged with reddish brown; each segment with stellate tufts of prickles, except the head and 13th; those on the 2nd and 3rd longest; eight on each segment, excepting the 7th to the 10th, which have but six, the row beneath the spiracular line on the other segments being missing in these; the prickles sting like nettles. Full-fed in November. Does not congregate in masses like gregarious larvæ, but a large number are often found scattered on the same branch. Food-plant, 'Peumo' (*Crytocaria peumus*).

"Pupa in loose cocoon among rubbish, or just under surface of ground.

"Imago in March and April. Comes freely to light. Common about Valparaiso."—*T. E.*

22. *Ormiscodes crinita.*

Bombyx crinita, Blanchard, in Gay's 'Chili,' Zool. pl. 4, fig. 4 (1854).

Ormiscodes cinnamomea, Blanchard (nec Feisthamel), *l. c.*, 7, p. 61, n. 2 (1854).

A pair; Valparaiso.

The *O. cinnamomea* of Feisthamel is an allied but quite distinct species, identical with Walker's *Dirphia plana;* the synonymy will therefore stand as follows:—

Ormiscodes cinnamomea.

Bombyx cinnamomea, Feisthamel, Mag, de Zool. 2e sér. pl. 22, fig. 2 (1839).

Dirphia plana, Walker, Cat. Lep. Het. 6, p. 1362, n. 22 (1855).

Catocephala, *Blanch.*

23. *Catocephala marginata.*

Ormiscodes marginata, Philippi, Linnæa Entomologica, xiv. p. 283, n. 19 (1860).

A single male.

Labelled as *C. rufosignata* of Blanchard, of which it may possibly be no more than a well-marked variety; it, however, has much paler and whiter wings, with less strongly defined markings, and with the pale spot at the end of the cell of primaries yellow, instead of white; in Mr. Edmonds's example the inner greyish band of the secondaries is almost wholly obliterated.

The succeeding species, which is represented by a single female, is undoubtedly Blanchard's insect; it answers well to his figure which represents the same sex.

The *Amydona humeralis* of Walker (Lep. Het. 6, p. 1413) is an allied species to *C. marginata*, and not a true *Phricodia*, as I formerly supposed.

24. *Catocephala rufosignata.*

Catocephala rufosignata, Blanchard, in Gay's 'Chili,' 7, p. 63, n. 2; pl. 6, fig. 1 (1854),

A female.

25. *Catocephala nigrosignata.*

Catocephala ? nigrosignata, Philippi, Linnæa Entomologica, xiv. p. 285, n. 21 (1860); Aid Ident. Ins. pl. 89 (1882).

One male example.

SATURNIIDÆ.

CINOMMATA, n. g.

Wings ample, triangular, with very straight margins; the outer margins slightly convex; wing-cells rather short; costal vein of primaries running to second third of margin; subcostal three-branched, the first branch emitted before end of cell, the two others making a long fork to apex; upper radial emitted close to subcostal; lower radial from about the middle of the disco-cellulars, which form an oblique line, median vein emitting its first branch a little beyond the middle, all three branches well separated; costal vein of secondaries running, close to the margin, to apex; all the other veins simple, two subcostals, one radial, and three medians; the disco-cellulars forming an elbowed line, from the angle of which the radial is emitted; head almost concealed from above, with broadly-pectinated antennæ in the male, palpi porrect, woolly, with the terminal joint exposed; thorax clothed with long straight hair above, woolly below, abdomen rather short and woolly; legs rather short, moderately thick; tibiæ and tarsi spinose, posterior tibiæ with two rather strong pointed terminal spurs.

26. *Cinommata bistrigata*, n. s.

Primaries above pale greyish olivaceous; a white stripe with dark brown outer edges running from base along median vein to the end of the cell, and then upwards in an oblique line to apex, where it joins a second similarly-coloured stripe from the inner margin near external angle; a dark brown stripe along the base of the fringe, which is otherwise whitish; secondaries pale sandy brownish, with a black dot at the end of the cell; a subangulated concave stripe of dark brown beyond the

middle; external area greyish, fringe with a dark brown basal stripe; body whitish, with a greenish tint, particularly about the tegulæ; antennæ testaceous; primaries below pale sandy yellow; costal border irrorated with grey scales; a black dot at end of cell; fringe as above; secondaries cream-coloured, irrorated with grey; a line of the same colour from abdominal margin to apex; a black dot at end of cell; fringe rather paler than above; body below cream-coloured, brownish in front; the collar, palpi, and upper surface of tibiæ and tarsi, blackish. Expanse of wings, 49 mm.

"Las Zonas, June and beginning of July."—*T. E.*

Seven males were in the collection of Mr. Edmonds; we also have one female from Valparaiso; it only differs in having almost simple antennæ.

Cercophora, *Felder.*

27. *Cercophora frauenfeldi.*

♂. *Cercophora frauenfeldi*, Felder, Reise der Nov., Lep. 4, pl. xcv. fig. 6 (1874).

Two pairs.

The female is rather larger than the male, and the caudate projection to the secondaries is reduced to a mere obtuse angulation at the extremity of the third median branch.

"It occurs sparingly about Valparaiso in March. It sometimes comes to light."—*T. E.*

The larva, a drawing of which I have before me (Plate I., fig. 5), is a most singular creature; the 4th segment being produced forwards beyond the head and two other segments (which are placed in a vertical line), in the form of an acute horn; the last segment also terminates in a similar horn; the central segments are widest and the posterior ones narrowest; so that the general character of this larva is less *Saturnioid* than in any species known to me; it more nearly resembles some *Papilio* chrysalides, the pupa of *Papilio sarpedon* being not unlike it, except in length. Colours: apple-green, with two semicircular pale rose-coloured spots in front, on the 3rd and 4th segments; a yellow lateral stripe terminating in the horns at either extremity, and

immediately above this a series of black elliptical stigmata, from which single black hairs are emitted; 5th and 6th segments with a dorsal rose-brown streak.

"Food-plant, 'Peumo' (*Cryptocaria peumus*) in November; moths emerge in February."—*T. E.*

EUDELIA, *Philippi*.

28. *Eudelia vulpes*, n. s.

Nearly allied to *E. venusta*; but the wings above of a foxy rust-red colour, the inner discal line thick, well-defined, and red-brown on all the wings; the outer line of primaries obsolete, but on the secondaries better defined than in *E. venusta*; the white ocellus of primaries larger, and touching the inner discal line; the small blackish spot at end of cell of secondaries obsolete, the costal half of secondaries flesh-tinted instead of pale yellow; the primaries much more falcate, and the secondaries with longer tail; the body above decidedly redder; the under surface differing also as above. Expanse of wings, 2 inches 11 lines.

Coral, in March.

"A male specimen will be found in the collection, rather larger and redder than the others (*E. venusta*), and with the transverse line on the fore wings touching the spot; this specimen was taken in Valdivia, and is the only one I have seen, so cannot say whether it is a distinct species or only a variety."*—*T. E.*

29. *Eudelia venusta*.

♀. *Lonomia venusta*, Walker, Cat. Lep. Het. 7, p. 1765 (1856).

Bombyx? aristoteliæ, Philippi, Linnæa Entomologica, xiv. p. 286, n. 22 (1860).

♂. *Eudelia rufescens*, Philippi, Stett. Ent. Zeit., 25th Jahrg. p. 91 (1864).

Valparaiso.

"Description of larva already sent. Both this species and *Cercophora frauenfeldi* occur sparingly about Valparaiso in March. They sometimes come to light."—*T. E.*

* There is no reason for supposing it to be the latter.—A. G. B.

POLYTHYSANA, *Felder.*

30. *Polythysana rubrescens.*

Attacus rubrescens, Blanchard, in Gay's 'Chili,' 7, p. 60; pl. 4, fig. 3 (1854).

Six males.

"Common in the forests of Valdivia, but very difficult to take; the males fly about the tops of the trees, in the sunshine between the hours 12.30 and 2 p.m. *only;* the females are nocturnal; larva unknown to me; on the wing in February and March."—*T. E.*

31. *Polythysana edmondsii*, n. s.

♂. Very near to *P. andromeda*, Philippi, but with the outer border of primaries snow-white internally, instead of being uniform with the rest of the wing; primaries above chiefly differing from *P. rubrescens* in the same character, but with the ocellus rounded; secondaries carmine, the interno-basal area and a band from just before the middle of the abdominal border to the costa black; abdominal half of disc and external border bright orange, with brown outer margin; the external border bounded internally with black, and touching the ocellus, which is of a deep crimson-lake colour, broadly bordered with black, and enclosing a white lunule; body as in *P. rubrescens;* under surface bright golden orange; the internal areas of all the wings and *the costal area of secondaries* washed with rose-red; ocellus of primaries black, with lake-red centre, enclosing a white pupil; the black internal edging widened into a broad almost ≷-shaped band; the snow-white patches as above; secondaries with the ocellus reduced to a minute lake-red oval spot, with white central line; internal boundary of external border silvery grey, with slender blackish inner edge, mixed with lake-red scales; outer margin and fringe ash-grey. Expanse of wings, 80 mm.

♀. Considerably larger than the male and with its pattern, but with the general coloration of *Saturnia boisduralii;* the brilliant colouring is confined to the ocelli of secondaries, the ground tint of these wings being pale flesh-coloured, with the external half of the disc up to the inner edge of the external area olive-brown. Expanse of wings, 110 mm.

One pair.

"Common at end of March and beginning of April, flying in the sunshine between 9.30 and 11 a.m., near Valparaiso, but flies even more swiftly than the white species; so that I obtained only three male specimens. I got two females, one of which was caught flying at night, and the other came to light. (Mr. Butler has one bad specimen; the other, which I have, has the crimson of the eye-like spots replaced by purple.) I was unable to find the larva of this species."—*T. E.*

31a. *Polythysana "albescens"=? P. cinerascens*, Felder.

Of this species (specimens of which Mr. Edmonds did not place in my hands) the collector says,—"Flies by day, between 9.30 and 11 a.m. *only*, but is rather scarce, and just as hard to catch as *P. rubrescens*. Occurs near Valparaiso, end of March and beginning of April. Mr. Butler has already the description of the larva*; it feeds on 'Peumo' (*Cryptocaria peumus*), and is full fed by the end of October or beginning of November.

"Cocoons among leaves of food-plant, open at one end (specimen sent).

"The female, of which I have only a single specimen, differs greatly from the male; the green markings are wanting, being replaced by different shades of red and brown."—*T. E.*

Hyperchiria, *Hübn.*

32. *Hyperchiria erythræa.*

Io erythræa, Philippi, Linnæa Entomologica, xiv. p. 277, n. 15 (1860).

Three females; Valparaiso and Valdivia.

Var. *olivacea.*

Differs from the typical form in the olivaceous tint of the primaries, the broader orange area on the secondaries, and the almost black external area of these wings.

Valparaiso.

* This may be so, but, as no specimens were in the collection, there was naturally no number by which to refer to the description: and I cannot find any clue to it, if I have it.

We have received this species from Valparaiso in both forms, so that I cannot think the olivaceous type more than a slight variety. The following may be distinct, unless the whole of the forms, including *H. erythræa* of Blanchard, are referable to one variable species, which is not impossible.

33. *Hyperchiria acharon*, n. s.

Primaries of male greenish grey, with a slight reddish tinge showing through; costal margin and fringe orange; black lines a little closer together than in *H. erythræa*; carmine spots at end of cell similar; of female less greenish, and consequently redder; the costal margin, fringe, and veins reddish orange; the black lines considerably nearer together than in *H. erythræa*, the inner one deeply sinuated; red spots as in the male; both sexes with the secondaries pink, but clouded or washed with blackish from basal third to outer margin; the black stripe placed farther from outer margin than in *H. erythræa*, but the carmine ocellus similar; fringe orange, redder in the female than in the male; body of male ochreous; the tegulæ pale greenish grey, almost white; antennæ testaceous; body of female rose-brown, with the tegulæ greenish grey; the thorax and head rather more rusty in colour than the abdomen. Expanse of wings—male 60 mm., female 69 mm.

A pair.

Var. *debilis*.

♂. Altogether yellower than the typical male, the ground colour of the primaries being sulphur-yellow, the base of the secondaries and fringe saffron-yellow, and the body a mixture of the two shades; the carmine spots on the primaries are also extremely small, and the inner line less irregular.

A single pair.

The female of this form is much paler than the type, and more rosy.

34. *Hyperchiria griseoflava*.

♂. *Io griseoflava*, Philippi, Linnæa Entomologica, xiv. p. 276, n. 14 (1860).

A pair.

The female is greyer than the male, with the external area of secondaries and body more rosy; excepting in its yellower tint throughout it comes very near to the female of *H. erythræa*, but the females of all these forms are more alike than the males.

35. *Hyperchiria erythrops*.

♂. *Io erythrops*, Blanchard, in Gay's 'Chili,' 7, p. 59; pl. 4, fig. 2 (1852).

A pair.

The female of this form is paler than any of the others, but comes nearer to the female of *H. acharon*, var. *debilis*, than to any other, excepting in the width of the external border of the secondaries, which is less by one-third. Taking the width of this border as a guide, the forms would stand thus: *H. acharon*, *H. erythræa*, *H. erythrops*, *H. griseoflava*; and if this should prove to be a reliable character, my var. *olivacea* will have to be regarded as a species distinct from *H. erythræa*, its border being no wider than that of *H. erythrops*.

NOTODONTIDÆ.

Drymonia, *Hübn.*

36. *Drymonia pica*, n. s.

♂. Primaries above snow-white at the base, with a subbasal 3-shaped black line, followed immediately by a broad black band with slightly irregular margins, and immediately succeeded by a second irregular slender black line upon a broad snow-white belt; a third black line close to the wavy outer edge of this belt, which is limited by a broad sericeous grey external border, crossed by blackish veins, sprinkled with white scales, and edged internally by a blackish streak at its costal and inferior extremities; fringe spotted with white; the central white belt is indistinctly traversed through its centre by a squamose greyish line, and is further interrupted by a black dash at the end of the cell; secondaries pearly white; outer margin and the extremities of the veins black; body snow-white, the posterior lateral margins of the collar, the extremity of the tegulæ, and the metathorax black; antennæ with reddish testaceous pectinations, under surface white; primaries with grey

external border almost as above, but rather paler, and with diffused inner edge; veins yellowish, probably owing to abrasion of the scales; secondaries with the extremities of the veins and the outer margin black, as above; tarsi banded with black. Expanse of wings, 35 mm.

♀. Differs from the male in having a rather broad grey border to the secondaries on both surfaces, and the whole under surface clouded with grey. Expanse of wings, 36—37 mm.

One male and two females.

This species comes nearer to *D. dodonæa* than to any other form with which I am acquainted, but the broad snow-white central belt on the primaries and pearl-white secondaries give it a very different aspect; it also differs from all the species of *Drymonia* known to me in the greater length of the subcostal fork on the secondaries.

HEPIALIDÆ.

CALLIPIELUS, n. g. (Plate I., fig. 6).

Form of *Charagia*, neuration very near to *Pielus*; wings ample, primaries triangular, the costal margin nearly straight to apical fifth, then slightly convex to apex, the latter obtuse; outer margin nearly straight, but curving round at external angle, which is consequently almost lost; inner margin slightly convex, running abruptly inwards at the base, broadly fringed throughout; costal vein running almost to apex; subcostal uniting at the base with the median; the branches are four in number, the first being forked towards apex; the first three, therefore, are emitted before the end of the cell, and the fourth from the anterior angle of the same; the ordinary fifth branch is emitted from the disco-cellulars, and thus becomes the first or upper radial; it starts at about the same distance from the true upper radial that the latter does from the true lower radial, or third radial of this insect; the third radial throws a recurrent vein through the cell to the base; the third median nervule is emitted from the disco-cellulars, and consequently becomes a fourth radial; it also throws a recurrent vein through the cell to the base; the disco-cellulars form a simple zigzag or open Z-shaped line; the median vein is necessarily two-branched, the third having become a radial, the

submedian vein united by a short subbasal oblique veinlet to an abbreviated curved longitudinal vein, which is again attached before its extremity to the median vein by means of a rudimentary interno-median veinlet; secondaries suboval, with nearly straight costal margin; costal vein fused with the subcostal to beyond the middle; subcostal four-branched, the first branch being forked towards the apex; the branches are in fact placed exactly as in the primaries, and, excepting that there are only three radials, so are the other veins, with the exception of the submedian, which is simple, as is also the internal vein; body very long and rather narrow for the family; the thorax clothed with long matted hairs; antennæ short, distinctly segmented and ciliate; palpi long and slender; legs rather short and thick.

37. *Callipielus arenosus*, n. s.

Aspect of *Pielus maculosus*, Felder* (a species of *Oxycanus* close to *O. australis*), with which it agrees in general coloration and pattern; primaries pale flesh-brown, clouded and streaked with darker brown, minutely irrorated with pale yellow, and covered with irregular silver spots and dashes with dark brown edges; a submarginal brown-edged silver stripe not reaching the costa or the inner margin; a marginal series of small oval brown-edged silver spots; a black-edged silver stripe through the cell, sometimes one or two black dashes on the disco-cellulars, and a series of oblique discal dashes in front of the silver submarginal stripe (but in the type these black dashes are not present); secondaries sandy ochraceous; a submarginal series of small irregular spots, slightly silvery, with dusky edges, and a submarginal series of small oval spots of the same character; thorax brown; abdomen pale sandy brownish; under surface sandy ochraceous; venter whitish. Expanse of wings, 73 to 81 mm.

Valdivia. From Reed's collection.

This species was labelled as "*Bombyx dedecora*, Feisth.," to which it bears no resemblance.

* Reise der Nov., Lep. 4, pl. lxxxi., fig. 1.

DALACA, *Walk.*

38. *Dalaca venosa.*

Hepialus venosus, Blanchard, in Gay's 'Chili,' 7, p. 70; pl. 4, fig. 6 (1854).
Dalaca nigricornis, Walker, Cat. Lep. Het., 7, p. 1560 (1856).

One specimen.

39. *Dalaca subferrens*, n. s.

♂. Somewhat variable in tint, the markings also varying in intensity; primaries golden testaceous, sometimes with a faint reddish gloss; with smoky brown markings, or, in better defined specimens, brown, with the markings testaceous as follows: costal border with a number of spots, many of which are rounded or fusiform, and contain blackish pupils; a broad and very irregular band commencing at the base, following the median vein to the middle of the disc, but expanded so as almost to fill the basal half of the interno-median area, and at its outer extremity uniting with a series of oblique confluent dashes, which run in a tapering series to costa; the whole of this testaceous band, from base to costa, is ornamented with dots and short lines of black; its basal expanded portion is moreover bounded on internal border by an oblique conspicuous black dash, beyond which the border is more or less golden testaceous in continuation of an external border of the same colour; the latter is ornamented with a submarginal and a marginal series of blackish dots; fringe pale testaceous; secondaries dull smoky grey, with a faint pinkish reflection; fringe pale testaceous; thorax dark brown; antennæ testaceous; abdomen pale greyish brown; under surface of wings grey, sometimes with whitish fringe; body below sordid-white; legs sometimes reddish. Expanse of wings, 32—38 mm.

♀. Primaries more distinctly red than in any of the males, the brown markings, or the brown intervals between the markings, almost wholly lost, only indicated by minute blackish-edged white dots scattered here and there over the wing; secondaries nearly as in the male, the grey a little bluer; thorax redder than in any male;

abdomen darker, excepting at the base; under surface similar. Expanse of wings, 47 mm.

Las Zonas; February.

A distinctly warmer-coloured species than *D. pallens*.

40. *Dalaca pallens*.

♀. *Hepialus pallens*, Blanchard, in Gay's 'Chili,' 7, p. 69; pl. 4, fig. 5 (1854).

Two males and one female.

This species is not the immaculate insect represented by Blanchard, as his diagnosis "*punctis minutis obscurioribus adspersis*" sufficiently shows in contradiction to his figure; the primaries are in fact greyish fuliginous, marbled with whitish spots, upon which are black dots; this is true of both sexes, though the pattern is most prominent on the males.

41. *Dalaca violacea*, n. s.

♂. Primaries slaty grey, glossed with violet; costal markings much as in *D. subfervens*; a small irregular testaceous patch, much like the Greek letter Ω filled in, at the centre of the disc, and upon it two brown dots; an irregular longitudinal abbreviated dark brown line, with chestnut-red superior border and pale yellow inferior margin at about the centre of the interno-median interspace; a few black dots along the outer margin; fringe reddish testaceous; secondaries greyish brown, with slight bronze reflections and sandy brown fringe; thorax purplish brown; antennæ smoky brown; abdomen greyish brown, sericeous; wings below greyish fuliginous, with sandy yellowish fringes; primaries with sandy yellowish or testaceous costal border, on which are one or two black dashes; body below whitish. Expanse of wings, 32 mm.

One male.

42. *Dalaca marmorata*, n. s.

Primaries cream-coloured, divided into spots and patches by intersecting irregular greyish brown bands and patches, on which are black markings somewhat as follows: the basal two-thirds of costal area, a disco-submarginal confluent series of almost square spots

not reaching the inner margin, and the basal half of the median interspaces greyish brown, speckled with minute black spots; a cuneiform black internal patch tapering, at its postero-superior extremity, up to the inferior angle of the median brown patch; a black abbreviated streak at base of cell, and a black, almost semicircular, spot at the end of the cell; the cream-coloured portions are also marked close to their edges with brown lines; secondaries grey, with two subapical blackish spots; fringe cream-coloured; thorax blackish brown, paler in the centre, and with smoky brown head and antennæ; abdomen greyish brown; the basal segments and margins of the other segments whitish; wings below greyish brown, sericeous; basal area and fringe pale; pectus fuliginous; venter whitish. Expanse of wings, 32—37 mm.

Two males. Las Zonas; February.

43. *Dalaca hemileuca*, n. s.

♂. Primaries above with the costal two-fifths and a broad internal patch, extending from the base almost to the external angle, dark sericeous-brown, almost black; the remainder of the wing pale sericeous whity-brown; a small testaceous spot at apical third, and below it two sericeous-grey spots placed tranversely; three similar spots from the lowest of these to the apex; an oblique whity-brown stripe across the outer extremity of the dark internal patch; pale area sparsely sprinkled with blackish scales; fringe whity-brown, greyish externally, and with a basal series of black dots; secondaries greyish fuliginous, slightly paler towards the base, with a dusky marginal line; a whity-brown line at the base of the fringe; thorax dark fuliginous-brown; antennæ testaceous; abdomen whitish grey; wings below grey-brown, the fringe with broad darker spots at the extremities of the veins; primaries with the costal border and interno-median area slightly paler and browner than the rest of the surface; secondaries with pale abdominal fringe; body below whity-brown. Expanse of wings, 30 mm.

♀. Larger, altogether paler, and with less defined dark and light areas on the primaries; secondaries with the basal area semi-transparent, dull white. Expanse of wings, 41 mm.

A pair.

Philanglaus, n. g.

Aspect of the *H. velleda* group of *Hepialus*, so far as markings are concerned, but with pectinated antennæ more like those of *Oxycanus*; the form of the wings more like that of the *Phaleridæ*; primaries obtusely triangular; veins unusually simple for the family; costal vein extending to apex; subcostal five-branched, the first branch emitted near the base, second just before the end of the cell, united by a very short cross-vein beyond the cell to the third branch, which starts with the fourth and fifth from the upper angle of the cell; these three last veins diverge towards the outer margin; radials emitted from the disco-cellulars, which are oblique; two short recurrent veins from the lower radial, united at the outer third of the cell; median vein three-branched, the last two branches emitted near together towards the end of the cell, first branch much curved, submedian sinuous; secondaries subtrigonate, the basal half of costal border projecting, very convex, apex rather acute, outer margin convex and very slightly sinuated between the veins; abdominal margin straight; costal vein wanting, its place occupied by the subcostal, which runs to apical fourth of costal margin, and has no true branches, two radials emitted from the disco-cellulars, which are transverse, diverging towards the apex, the upper one emitting a recurrent vein backwards through the cell almost to the base of the subcostal vein; median vein four-branched, the fourth (which represents the true radial vein of other moths) emitting a looped recurrent vein into the cell; submedian represented by two subparallel veins; internal vein simple; thorax very robust, broad, narrowing behind; head short; palpi short, thick, not extending in front of the head; antennæ rather long (about two-fifths as long as primaries), pectinated to the tips; abdomen rather broad at base, tapering and compressed towards the anal extremity; legs rather long and thick, the tarsi being longest.

44. *Philanglaus ornatus*, n. s.

Primaries above with the costal area white; the oblique area crossed by the median and radial veins greyish brown; the external and internal areas pale sandy brown; markings sharply defined dark ferruginous,

with snow-white borders as follows: two small basal spots; an oblique and very irregular marking from near base of costa to external third of inner margin, its centre subquadrate, and only separated by its white border from an indistinct semicircular spot at basal third of inner border, its infero-exterior extremity elbowed and acuminate; two small spots (darker than the other markings) just before the middle of the costal border; an abbreviated oblique band across the end of the cell; two or three small dark spots on the disc and a slightly irregular discal band, its costal portion expanded, and tri-digitate towards costa, much constricted on the upper radial interspace, but gradually expanding from thence almost to the first median branch, where it is excavated and terminated in a short point; fringe traversed by two pale brownish lines, between which is a whitish line; secondaries pale sericeous sandy brown, a feebly undulated darker line beyond the middle, a second close to outer margin, and two, with a white line between them, on the fringe; thorax whity-brown streaked with grey; tegulæ white, with brown bands; collar white, with a brown spot on each shoulder; head white, with brown vertex; antennæ white, with brown pectinations; abdomen greyish white; under surface pale sandy brown; wings with greyish bands, those of the primaries representing the markings of the upper surface, which become reddish brown, and therefore distinct towards the costa; secondaries with the convex portion of the costal border edged with white, behind which is a ferruginous patch diffused backwards over the cell, but interrupted within the end of the cell by a white spot; a bifid costal spot towards apex, connected below with an undulated discal line and a small triangular apical spot; an indistinct oval spot near the base of the interno-median area, which is whiter than the rest of the wing; fringe with a pale basal line limited by a greyish line, beyond which are one or two white spots. Expanse of wings, 55 mm.

A male.

Explanation of Plate I.

Fig. 1. Larva of *Deilephila euphorbiarum*, Boisd.
2. ,, *Deilephila annei*, Guér.
3. ,, *Protoparce eurylochus*, Phil.
4. *Thanatopsyche canescens*, Butl.
4*a*. Pupa-case of ditto.
5. Larva of *Cercophora frauenfeldi*, Feld.
6. Neuration of *Callipielus*.

II. *On a small collection of* Lepidoptera *from the Hawaiian Islands.* By A. G. Butler, F.L.S., F.Z.S., &c.

[Read February 1st, 1882.]

Last year I received from the Rev. Thomas Blackburn a letter (dated 4th July), in which he says:—"I have an unexpected opportunity of sending a parcel to London by the hands of a friend who is going home by the overland mail this month; so avail myself of it to send you another small collection of Hawaiian Lepidoptera consisting of nineteen specimens. Unfortunately of most of these there is only one specimen, but they represent the rarities *par excellence*, as far as my experience goes; indeed of many of them I have only a single specimen retained for my own collection as type. After having for five years failed to get more than two or three specimens, it seems little use waiting longer. If I *should* have the good fortune to meet with a few more specimens of any, I would not fail to remember your needs."

About a month later the box of specimens came to hand, but the constant ingress of larger collections requiring immediate attention has rendered it impossible until now for me to undertake the identification of Mr. Blackburn's specimens.

The collection consists of two butterflies and twenty-three moths referable in all to nineteen species, principally of the Micro-Lepidoptera (in Staudinger's sense).

RHOPALOCERA.

LYCÆNIDÆ.

1. *Polyommatus bæticus* (No. 170).

Papilio bæticus, Linnæus, Syst. Nat. i. (2), p. 789 (1767).

A pair.

"From memory I take this to be *P. bæticus*, but am not sure. I have bred it from larvæ feeding in pods of

what appears to be a *Melilotus*. The following is a description of the larva :—

"Obscure olive-green, pretty thickly sprinkled with short hairs (much the appearance of a bristly surface badly shaved); dorsal and subdorsal lines and the region included obscurely rosy; head testaceous, bearing a black V-shaped mark, which points backwards; the rosy markings vary in intensity, as also the ground colour; legs of the ground colour; spiracles white. Onisciform."—*T. B.*

HETEROCERA.

Before proceeding to the moths it may be useful to record the probability that Wallengren's *Anthœcia inflata* (Wien. Ent. Monatschr. 4, p. 172), is a *Heliocheilus* (Felder); it is said to occur at Honolulu, but examples have not yet been sent home by Mr. Blackburn.

LEUCANIIDÆ.

2. *Leucania extranea* (No. 167).

Leucania extranea, Guenée, Noct. i. p. 77, n. 104 (1852).

The male example now sent is very different from typical specimens of the species, the primaries being less acute at apex, of a deeper colour, and crossed by three ill-defined greyish bands, but the ordinary markings are all present and well defined. Until, therefore, I am able to examine and compare carefully the whole of our very extensive series of specimens referred to this species, and can thereby decide whether they represent one widely distributed and variable species, or a number of allied geographical species, it will be premature to regard the Hawaiian form as distinct. Mr. Blackburn speaks of it thus :—"Apparently rare, but widely distributed; I have taken it at light in Honolulu, and at rest on a tree-trunk in Hawaii."

GONOPTERIDÆ.

3. *Gonitis hawaiiensis*, n. s. (No. 15).

Primaries sericeous reddish coffee-colour, striolated with grey, and irrorated towards the base and on the disc with black atoms; the external border limited

internally by a zigzag greyish line; a very slender brown-edged pale discal line, irregularly zigzag from costa to second median branch, where it turns abruptly inwards, and then in a slightly concave transverse line to inner margin; two or three indistinct pale undulated lines (diverging from the inner margin towards the costa) across the basal half; reniform spot indicated by a few greyish scales at the anterior angle of the cell, and by a small pale-edged black spot at the posterior angle; fringe pale ochraceous or dull straw-yellow, traversed by a brown stripe; secondaries greyish brown, with bronze reflections; costal border whitish, pearly at the base; fringe stramineous at base, traversed by a greyish brown stripe, and tipped with white; thorax rather paler than the primaries; abdomen fuliginous-brown, with whitish hairs at base; last four segments reddish testaceous at the sides; primaries below greyish, shining, with cupreous reflections, the interno-basal area whitish, a basi-subcostal spot of ochreous, shading into a diffused discoidal rose-coloured patch; basal half of costal border crossed by short oblique blackish dashes; an arched abbreviated pale-edged blackish line from costal margin beyond the cell to the lower radial vein, where it becomes obsolete, the continuation as a greyish stripe being only visible in certain lights; the wing-surface beyond this line transversely striolated with grey, terminating near the outer margin, as above, in a zigzag diffused line, which indicates the inner limit of the external border; secondaries whitish, striated with blackish, the costal two-fifths and a diffused interno-median longitudinal streak washed with rosy ferruginous, and crossed by two vague dusky bands limited externally by the two usual dentate-sinuate discal lines, the inner one more defined than the outer, but both of them indistinct, excepting upon the reddish areas; fringe rather paler than above; body below dull rosy brown. Expanse of wings, 35 mm.

A small species for the genus, being, both in size and the outline of the primaries, similar to the species of *Cosmophila*, though in coloration, pattern, and structure it agrees with typical *Gonitis*.

"Apparently very rare. The specimen I send is unfortunately somewhat mutilated in respect of legs and antennæ, but otherwise is a good type. I captured it years ago, and have since failed to procure a second

specimen until a month ago, when I obtained a fine one, precisely identical with the one sent, at light. Both these specimens occurred near Honolulu."—*T. B.*

Mr. Blackburn remarks that he has only seen *Toxocampa noctivolans* on Maui.

HYPOCALIDÆ.

4. *Hypocala velans* (No. 168).

Hypocala velans, Walker, Cat. Lep. Het. xiii. p. 1177, n. 11 (1857).

"Another rare but widely-distributed insect; I have taken it at light in Honolulu twice; also have beaten it from a tree near Honolulu; also have started it off rocks on Maui. All the specimens, however, were much worn except the one I send and another; one worn specimen is somewhat larger than that I send, and has perfect simple antennæ. Doubtless a female."—*T. B.*

The species of *Hypocala* seem to be remarkably constant considering the close resemblance of nearly all the species to one another; we have three examples now of *H. velans*, and, although nearly allied, they can be distinguished at a glance from an Australian species (apparently undescribed), and from the Indian *H. violacea*, to which they have greater affinity than to any others.

PYRALIDÆ.

5. *Locastra monticolens*, n. s. (No. 158).

♂. Primaries above black-brown, sprinkled with orange scales; with opaline white markings as follows: a slightly irregular belt near the base enclosing two squamose dusky spots; a bell-shaped spot across the cell, and an oblique abbreviated stripe, with zigzag outer edge just beyond the cell; these markings are all bounded externally by black lines; immediately beyond the oblique stripe is a small white γ-shaped costal marking; fringe black; secondaries greyish brown, only semi-opaque so as to show the under-surface markings indistinctly through the texture of the wing; external border blackish; thorax black, spotted with white, and with a white stripe along each side; abdomen brown, with white posterior margins to the segments; under surface of wings pale pearly dove-brown, with blackish

external borders; primaries with iridescent greyish internal area; a large spot in the cell, a still larger one at the end of the cell, and an inverted falciform discal line black; apical half of costal border white spotted with black; secondaries with a dot in the cell, a spot at the upper angle of the cell, a still larger spot at the projecting lower angle, and a subconfluent discal sinuous series of unequal spots black; body below white; legs banded with black. Expanse of wings 23 mm.

The smallest species yet described; it has the usual characteristic indentation of the costal margin of the primaries, but it is less strongly defined than in males of allied species, being little more than an irregularity of the surface near the edge of the wing. Of this species Mr. Blackburn says:—

"I have taken at different times three specimens of this species, all flying about some precipitous cliffs, 1500 feet or so above the sea, not far from Honolulu. They were taken by day; they appear to be of the same sex."

STENIIDÆ.

6. *Metasia? abnormis*, n. s. (No. 165).

Fuliginous-brown; wings with a blackish line along the outer margin; fringes white, traversed by a blackish line; primaries crossed near the base by a >-shaped line, just before the middle by a sigmoidal line, and half-way between the cell and apex by a slightly irregular arched line, all dark brown with white borders; a blackish dot at the end of the cell; secondaries with basal half white, gradually shading into the brown colour of the outer half; abdomen with white posterior margins to the segments; wings below with fringe as above; primaries greyish, with slight bronze reflections, the commencement of the third transverse line of the upper surface visible at costa; basal area and internal border white; secondaries white, with an abbreviated discal stripe from the costal margin, and the apex brown; body below white; anterior tibiæ and tarsi brown above. Expanse of wings, 15 mm.

"Occurs on rocks in the bed of a mountain stream near Honolulu, over which it flies freely in the sunshine."—*T. B.*

Mr. Blackburn notes this as a female, and suggests that it may be that sex of No. 155; but, although only one rather worn example has come to hand, I cannot think that it has anything to do with that insect; apart from its very different pattern, it appears to me to be itself a male; at any rate it has as well developed an anal tuft as in many males among the *Pyrales*.

I am not satisfied that I have done right in referring this species to *Metasia*, for, although the structure appears to be very nearly, if not quite, the same, the style of coloration is nearer to that of *Stenia*; if, however, it were placed in that section of the family it would have to form the type of a new genus on account of its short palpi, and, in order satisfactorily to describe its characters, it would be necessary to have a really good specimen.

7. *Scotomera hydrophila*, n. s. (No. 163).

Pale fuliginous-brown; primaries irrorated with black scales; crossed at basal third by an angular almost 3-shaped brown-edged pale stripe, and half-way between the cell and apex by a simply angulated stripe, minutely zigzag throughout, and edged with dark brown; between these two stripes is a pale zigzag oblique line bounding three small black spots, the uppermost of which is on the costal margin and the two others at the end of the cell; the costal border between the oblique line and the discal stripe is pale (whity-brown), and a spot of the same colour is on the costal border near apex; a submarginal series of externally whitish-edged black dots, followed by a blackish marginal line; fringe whitish, traversed by a grey stripe; secondaries paler than primaries, with black marginal line; fringe broader than on primaries, but similarly coloured; primaries below dark shining grey, with the interno-basal half white; costal border streaked with white; a submarginal series of blackish dots, followed by a whitish marginal line; fringe brown, darker at the base; secondaries shining sordid-white, crossed by a slender grey discal line; a black marginal line; fringe greyish, with whitish basal line bounded externally by a grey line; body below pearly white. Expanse of wings, 13 mm.

A specimen slightly larger than the type (15 mm.) is sent under the same number, but it is much rubbed, and

what pattern it has left seems to differ somewhat from that of the smaller example, so that I feel a little doubtful as to its identity.

"Occurs near a stream about twenty miles from Honolulu."—*T. B.*

I find that the genus *Scotomera* is more nearly allied to *Stenia* than to anything else.

BOTIDIDÆ.

Mestolobes, n. g.

Apparently more nearly allied to *Phryganodes* and *Godara* than anything else, but very distinct; the form of the primaries most like that of *Godara*, with the inner margin close to the base lobed and fringed with long scales, much as in *Lophopteryx*; the secondaries have a deep longitudinal fold, at the extremity of which the outer margin is distinctly indented; the discoidal cell of the primaries is long, that of secondaries very short; the typical species has a broad curled pencil of long coarse hairs between the wings at the base; the head is large, the palpi short and thick, the antennæ thick (especially in the type), the thorax robust, the abdomen moderately broad, only extending a short distance beyond the secondaries, with well-developed anal tuft; the type with two long forked basal pencils of hair at the sides; legs rather slender, compressed; middle tibiæ coarsely scaled, and with two long terminal spurs below, and an acuminate terminal tuft above; posterior tibiæ usually with an expanded fan-like tuft of hair-scales above near the extremity, with two long slender subterminal spurs, and a similar terminal spur below; the distal extremity above acuminate, as in the middle tibiæ. Type, *M. ænone*.

8. *Mestolobes ænone*, n. s. (No. 155).

♂. Primaries above dark fuliginous-brown, crossed by two black-edged angulated white lines, the first zigzag at basal fourth, the second simply elbowed, but slightly irregular at external fourth; a submarginal cream-

coloured stripe, bounding a marginal series of externally white-pupilled black spots; fringe whitish, spotted with grey, and with a black basal line; a black lunule at the end of the cell; secondaries creamy white, with a large quadrate apical blackish spot separated from the outer margin by a slender white line; beyond this is a slender abbreviated black line at the base of the fringe, which is white, faintly tipped at apex with grey; basal hair-pencil white; lateral forked hair-pencils white, tipped with black; head white; antennæ brown above, white below; thorax blackish, with the borders of the tegulæ white; abdomen with the basal segments white, the other segments blackish edged with white; anal tuft testaceous; primaries below with the basal third cream-coloured, the internal border white, the remainder of the wing brown, shot with bluish grey; two cream-coloured costal spots, the first only separated by a narrow oblique brown line from the basal area, the second larger and placed just beyond the middle of the costa; (a slightly curved indistinct whitish submarginal line)*; a sharply-defined whitish marginal line; fringe pale brown, with a black basal line; secondaries below cream-coloured; a large grey lunate spot from costal margin to subcostal fork; a grey apical spot; fringe as above; body below cream-coloured; anterior tibiæ and tarsi banded above with black; middle tibiæ banded above near the base; posterior tibiæ with the fan-like tuft of hair black, tipped with white on its upper surface. Expanse of wings, 13 mm.

Two specimens.

"This species occurs on rocks in the bed of a mountain stream near Honolulu, over which it flies freely in the sunshine."—*T. B.*

9. *Mestolobes simæthina*, n. s. (No. 157).

Dark fuliginous-brown, sericeous; basal fourth of primaries darker and bounded externally by a blackish line, and followed almost immediately by a transverse bracket-shaped black-edged white or testaceous stripe; a second angulated externo-discal stripe beginning in a pale yellowish costal dash, and continued as a series of

* Perhaps due to abrasion.

white dots to the inner margin; between these two stripes is an abbreviated crinkled black-edged testaceous stripe, which crosses the end of the cell; a marginal series of black-edged white dots; fringe grey, black at base, and traversed by a slender white line; secondaries with the basal two-thirds paler; a large ovoid mealy yellow patch on the costal area of the male, and resting upon it a broad basal pencil of curly pale yellow and white hairs; fringe broad, white, traversed near the base by a black stripe, and broadly tipped with grey; abdomen of the male with ochraceous basal segments; anal tuft banded with white at the base; primaries below grey, with bronze reflections, inner border broadly silvery white; an indication of the white discal stripe of the upper surface; fringe almost as above; secondaries sordid creamy whitish, with grey discal stripe and external border; fringe nearly as above; body below creamy whitish; palpi blackish; anterior tibiæ and tarsi banded above with black. Expanse of wings, 13 mm.

"Two specimens, male and female, on rocks in the beds of mountain streams, high up in the mountains; flies freely in the sunshine."—*T. B.*

Until I had carefully examined the structure of this species I mistook it for a *Simæthis* or *Orosana*; it, however, possesses the distinctive characters of *Mestolobes*, differing only from the typical species in the absence of the lateral abdominal hair-pencils and the tibial tufts of the posterior legs; each of the three species differs in its brush ornamentation, and on that account some authors would doubtless regard them as types of different genera.

10. *Mestolobes semiochrea*, n. s. (No. 156).

♂. Primaries with the basal third whitish, minutely irrorated with grey, and bounded externally by a nearly-straight white line, followed immediately by a black stripe, upon which are four small buff-coloured dots, two black dots placed obliquely from costal margin near the base; external two-thirds greyish brown, mottled with whity-brown; a slender angulated and undulated externo-discal blackish line, bordered outwardly with whitish, and commencing upon the costa in a small buff spot; a

subapical costal blackish reniform spot, followed by a buff-coloured apical spot; a submarginal series of black dots, followed by a slender buff-coloured marginal line; fringe buff-coloured, with a black basal stripe, and tipped with black; secondaries pale ochreous, with two bisinuated parallel blackish marginal lines; body above pale brown; abdomen with the basal segments whitish, the other segments black-edged; under surface pale creamy buff; primaries with two black costal spots, between which the margin is grey, the costal margin towards the base blackish; apex and external area broadly grey, two white costal spots; fringe greyish, with blackish lines as above; secondaries with a small costal grey lunule at apical third, and a few indistinct dots along the margin; fringe greyish, excepting at the base; body whitish; legs white; the tibiæ and anterior tarsi with black ornamentation above almost as in *M. ænone*, but the bands narrower. Expanse of wings, 13 mm.

"The female is unknown to me. I have taken two or three specimens singly in mountain localities near Honolulu."—*T. B.*

This species curiously resembles the female of *Mecyna exigua* in coloration.

11. *Scopula constricta*, n. s. (No. 108).

Allied to *S. dipsasalis* of New Zealand, but still more closely to *S. fulvalis* of Europe; from dark examples of the latter species it differs in its still darker, redder, and more sericeous primaries, the macular character of the *black* lines upon both surfaces, the narrow ↄ-shaped character of the reniform spot, the smaller and more rounded orbicular spot, the sharply-defined and larger black submarginal spots, the slightly paler and distinctly more sericeous colouring of the secondaries, the reddish brown coloration of the thorax and palpi, the considerably greater length of these organs, the rust-red colour of the tibiæ and tarsi, and of the costal border of primaries on the under surface: lastly, in the very distinct black maculation of the under surface of the wings, the ordinary blackish discal line being replaced by a series of black spots. Expanse of wings, 22—24 mm.

"This curious insect was bred from a small batch of green larvæ feeding between spun together leaves of a plant growing high up the mountains near Honolulu. I found *Deilephila calida* feeding on the same plant. Pupa in a rather firm cocoon of leaves and silk. I note a peculiar character in this . . . species in the strong and abrupt contraction of one of the middle segments of the hind body: this is even more conspicuous when the insect is alive than when it is dead and dry. The female has simple slender antennæ."—*T. B.*

SCOPARIIDÆ.

12. *Scoparia coarctata*, Zeller, var? *montana* (No. 160).

This is certainly conspecific with the example previously received (No. 102); it differs from European examples in the less evidently angulated upper extremity of the externo-discal white line of the primaries, and in the blackish instead of white internally conical outer border of these wings; this blackish border, which is doubtless an exaggeration of the submarginal series of black spots, is interrupted close to the margin by a delicate undulated white line representing the straight white line of typical *S. coarctata*; the costal margin of the primaries is also a little shorter, and the outer margin straighter. Expanse of wings, 15 mm.

"Occurs on the mountains of Honolulu, but rarely."—*T. B.*

The specimen of this species previously received was a little rubbed, and therefore I unhesitatingly identified it as *S. coarctata*, to which it bears a close resemblance; the example now forwarded, however, shows distinct colour-characters on the external area of the primaries (which in the first specimen were wholly obliterated); it moreover agrees with the first specimen received in its slightly inferior size and more truncated primaries; I therefore now feel some hesitation in regarding it even as a variety of Zeller's species.

CRAMBIDÆ.

13. *Eromene bella* (No. 103).

Tinea bella, Hübner, Samml. Eur. Schmett. v., Tin. ii., Pyralidiformes B., fig. 60.

"Apparently very rare. I have taken two specimens at long intervals, both in Honolulu."—*T. B.*

The specimen forwarded agrees well with European examples.

TORTRICIDÆ.

14. *Teras illepida*, n. s. (No. 99).

Primaries above reddish clay-coloured, reticulated all over and dotted with dark grey; two distinct lines of the same colour across the external third, the inner one running obliquely inwards towards the costa, widely bisinuated, the outer one nearly straight, running from costal to outer margin (near the external angle); a minute inconspicuous black dot at the end of the cell; fringe greyish, with a slender whitish basal line; secondaries dark greyish brown, pale grey towards the base, and with silvery white costal border; the dark brown area obscurely spotted with blackish; fringe white, greyish at apex, and with a very slender dusky subbasal line; body reddish clay-coloured, the centre of the abdomen black; primaries below shining blackish brown; the costal border and apex white, reticulated with dark brown; fringe as above, but with a bronze reflection; internal border silvery whitish; secondaries shining silvery or greyish white, the apical two-thirds striated with black; fringe white, tipped with grey at apex; body below silvery white; palpi and upper surface of anterior and middle tibiæ ferruginous; the tarsi of these legs above brown, minutely annulated with white. Expanse of wings, 17 mm.

"In neighbourhood of Honolulu; rare."—*T. B.*

This species seems a little aberrant, the primaries being narrower than usual towards the base; the palpi are deflexed in the specimen forwarded (which is unfortunately a little broken), but without seeing more examples I cannot decide whether this is their natural position.

15. *Protocopteryx walsinghamii*, n. s. (No. 161).

Smoky brown; wings with cream-coloured fringe, traversed by a slender dusky line; primaries with a costal series of small oblique black dashes with greyish borders; external border blackish, bounded internally and divided into three parts by three slightly curved silvery grey lines; central area from dorsal margin to second median branch clouded with blackish, and crossed by a silvery greyish oblique band enclosing a slender blackish line; a cuneiform black spot within the end of the cell; remaining areas traversed by parallel slender dark brown lines directed backwards from the costa; secondaries with the basi-costal area whitish brown; basal area slightly pale; a slender whitish marginal line; body brownish testaceous; under surface shining fuliginous-brown; fringe greyish; costal border of primaries pale buff, spotted with blackish; posterior legs silvery whitish. Expanse of wings, 12 mm.

"In the neighbourhood of Honolulu."—*T. B.*

Mr. Blackburn thinks that this species may not be rare, but "only overlooked"; it is much like typical *P. blackburnii* in the pattern of the primaries above; but these wings are altogether browner in colour; the pattern and coloration of the under surface, particularly of the secondaries, is very dissimilar.

TINEIDÆ.

16. *Tinea simulans*, n. s. (No. 159).

In colour and pattern almost exactly like *Œcophora picarella* of New Zealand, but allied to *Tinea picarella* and *T. nigralbella* of Europe; primaries above milky white, with black markings as follows: a cuneiform spot at base of costal border, and a small spot at base of submedian vein; a transverse oblong abbreviated band, to the infero-internal angle of which a short oblique dash is attached, at basal third; two small spots close to the middle of costal and dorsal margins, a small spot at external angle; the remaining spots are connected and form a slightly irregular *K*-shaped character, extending from between the two central spots to the extremity of the fringe; secondaries silvery grey; head and thorax above white; shoulders black; abdomen shining grey;

under surface shining silvery grey, with slight æneous reflections. Expanse of wings, 16—20 mm.

Two examples; Honolulu.

ELACHISTIDÆ.

17. *Laverna parda ?* Butler, var. *montivolans* (No. 162).

This form only differs in the grey instead of yellow colour of its head from the variety (No. 127) described by me last year (Ann. & Mag. Nat. Hist., ser. 5, vol. 7, p. 406); it agrees with that form in size, tint, and the distinctness of the black spots on the primaries, and when compared with typical *L. parda* makes me inclined to doubt my former conclusion that the difference in size and coloration was due to variation. I now think it quite possible that the two forms will prove to be specifically distinct.

"In mountain localities near Honolulu."—*T. B.*

18. *Laverna aspersa*, n. s. (No. 106).

Primaries above chalky white, three conspicuous dark brown costal spots upon the basal three-fifths of the border, and a longitudinal series of more or less hastate dark brown spots from base to outer margin through the interno-median area; the whole area between these two series (from base to apex) conspicuously spotted with small elongated testaceous spots with dark brown centres; secondaries shining silvery; body above white; antennæ brownish, excepting at the base; wings below shining bronze-brown; primaries with white costal fringe; body below silvery white, metallic. Expanse of wings, 12 mm.

"In mountain localities near Honolulu."—*T. B.*

PTEROPHORIDÆ.

19. *Platyptilus littoralis*, n. s. (No. 169).

Nearest to *P. falcatalis* of New Zealand, but differing in the colour of its legs, in the shape of the black patch at the end of the cell of primaries, and in the much less conspicuous and less purely white submarginal stripe; it is also allied to *P. zetterstedtii*. Primaries above pale golden brown, with slightly darker oblique mottlings; the base of median vein and a longitudinal central streak

spotted with dark brown; costal border to apical fifth blackish, spotted with elongated whitish spots; a small white dash at the end of the cell, and above and beyond it a large diamond-shaped black-brown patch (answering to the ordinary triangular spot of the genus); the angular outer edge of this patch forms an internal boundary to a broad ochraceous belt, divided by the usual cleft, and enclosing close to its outer edge (answering to the submarginal stripe of *P. falcatalis*) a series of elongated black spots; two more slender black spots or dashes are upon the costal margin; external border smoky brown; secondaries shining greyish brown; body above rather pale brown; palpi blackish; abdomen with a white-edged conical black spot on each side at the base; the remaining segments brown at the sides, mottled with black; anterior femora and tibiæ black above, the latter white at the base; tarsi wholly white; middle femora dark brown; tibiæ black, banded with white; tarsi white; posterior femora dark brown; tibiæ and two basal joints of tarsi black; terminal joints white; wings below greyish brown, shining; primaries with a diffused ferruginous spot, followed by an oblique ochreous costal spot, beyond the cell; a slender interrupted submarginal white line; body below pale buff; legs below creamy white, banded with black at the knees and tibial joints. Expanse of wings, 22 mm.

One example.

"Occurring on shores of a small mountain lake near Honolulu."—*T. B.*

III. *Descriptions of the insects infesting the seeds of* Ficus Sycomorus *and* Carica. By J. O. Westwood, M.A., F.L.S., &c.

[Read February 1st, 1882.]

Plates II., III., IV. and V.

It is with much pleasure that I forward to the Entomological Society the completion of a memoir on the insects infesting the seeds of *Ficus Sycomorus* and *Carica* in Egypt and the South of Europe, of which the first portion was read before the Society on the 2nd January, 1837, and was published in the second volume of the Transactions of the Society. It is entirely due to the zeal and untiring perseverance of Sir Sidney S. Saunders that I am enabled to make this additional communication to the Society, accompanied by the extensive series of illustrations representing the structural details of some of the most remarkable hymenopterous insects hitherto discovered, of which the sexes of a most anomalous character are now clearly ascertained. This gentleman has placed in my hands not only numbers of specimens, both dead and alive, of the two species of insects described in my memoir on Caprification, but has also made and allowed me unlimited use of a large series of microscopical preparations and dissections of the insects, exhibiting the most remarkable portions of their organisation.

In the Linnean cabinet is contained a number of winged specimens of the females of the species which I described and figured in my former paper under the name of *Blastophaga Sycomori* (Trans. Ent. Soc. Lond. ii., pl. xx., fig. 4). With these were also preserved several small, almost shapeless, apterous insects, respecting which both Mr. Haliday (who assisted me in examining these insects) and myself were unable to arrive at any satisfactory conclusion, regarding them as undeveloped monsters of some kind, and not supposing it possible, from analogy with all other known species of insects in which the females are winged, that these little creatures

could be the wingless males of *Cynips Psenes* or *C. Sycomori*.

The memoir of Sir S. S. Saunders, published in our Transactions for 1878, p. 313, has shown satisfactorily that not only are these little wingless creatures the legitimate males of the *Blastophaga*, but also that the *Sycocrypta* of M. Coquerel (Rev. et Mag. Zool., 2nd ser., vii., 365 and 422, pl. 10, fig. 3) is the male of a species of *Blastophaga*, as well as that the two species of *Apocrypta* of Coquerel (*ibid.*, pl. 20, figs 1 and 2) are the males of my genus *Sycophaga*, of which only the female (*S. crassipes*, Westw., *op. supr.*, pl. xx., fig. 5) was known, and of which the *Chalcis explorator* of Coquerel (pl. 10, fig. 4) is certainly another female.

In my former memoir I pointed out the relationship of these insects with *Agaon paradoxum* of Dalman, and added that the curious little group which I described were "certainly referable to the *Chalcididæ* rather than to the *Proctotrupidæ*," but that, from their fruit-feeding habits and various anomalous portions of their structure, I hesitated to name any particular group of the former family to which they ought to be considered as most nearly allied.

M. Coquerel, in describing several species of fig insects, and unacquainted with my former memoir, regarded them as belonging to the *Heterogyna* of Latreille, but he hesitated between the opinion of Shuckard, who considered my *Typhlopone* as being composed of the females of *Labidus* and *Scleroderma* as wingless females of *Myzine*, and that of myself, who considered *Typhlopone* as neuter *Formicidæ*, and *Scleroderma* as belonging to the *Bethylides*.

M. Coquerel, however, adds:—"Je crois cependant que l'avis de M. Shuckard finira par prévaloir. Je dois me borner, pour aujourd'hui, à faire connaitre trois insectes singuliers que j'ai recueillis à l'île Bourbon et que je regarde comme les femelles aveugles et aptères de quelque mâle ailé et inconnu, et qui me paraissent devoir prendre place à côté des *Scleroderma*." Of these little apterous insects M. Coquerel found "une infinité" inside the figs, in which he also found the "petits Chalcidites," which "volaient à l'entour," the former living "pêle-mêle avec les Chalcidites, qui selon toute apparence s'étaient développés à leurs depens."

The researches of Sir S. S. Saunders have fully proved

that M. Coquerel's supposed wingless females are the wingless males of winged females, and that they certainly are not parasitic on their winged partners. My two memoirs on *Scleroderma*, published in our Transactions (vol. ii. and 1881), and the illustrations of the sexes of *Scleroderma* given in my 'Thesaurus Entomologicus' (Pl. 31), will equally show that whilst *Scleroderma* is referable to the *Bethylides*, the fig-insects have no real relationship therewith.

Discarding then the supposed relationship of these fig-insects with the *Heterogyna* of Latreille, as well as with the Bethylideous *Sclerodermæ*, we must search for their genuine allies in the other great divisions of the Spiculiferous Terebrantia (see my Introd. Mod. Class., Ins. ii. p. 124), namely, the gall-feeding *Cynipidæ*, with a subspiral ovipositor; or the parasitic *Ichneumonidæ*, with a straight ovipositor and straight multiarticulate antennæ having a short basal joint; or the parasitic *Chalcididæ*, with a straight ovipositor and more or less elbowed few-jointed antennæ, having a long basal joint. The difficulty attending the adoption of a classification in which either structure or economy is implicitly adopted, is well shown in some of these Terebrant groups, whether families or genera. Thus in the vegetable-feeding gall-making *Cynipidæ* we have species which are parasitic on other insects, as is the case with the little species of my genus *Allotria*, of which I observed a female in the act of ovipositing in the body of a rose-aphis, and subsequently reared specimens hatched from infested Aphides. Other parasitic species of *Cynipidæ* are also recorded in my 'Introduction' ii., p. 132.

We thus see that Phytophagism is no bar for the exclusion of parasitism as an exclusive character of the *Cynipidæ*; but the structure of the fig-insects, especially as shown in the females (whose character must be considered as more truly normal than that of the males), recedes so entirely from that of the *Cynipidæ* that we cannot for a moment adopt the suggestion that the fig-insects are *Cynipidæ*; in fact, although phytophagists, they are certainly not gallicolists.

With the parasitic *Ichneumonidæ* and *Chalcididæ* it might be urged that they are more nearly related, notwithstanding their plant-feeding habits; and here again we are led not to place too much weight upon economy, from the fact that some species of *Eurytoma* (next to

which genus Latreille placed Dalman's *Agaon*) are plant-feeders; this is well ascertained to be the case with *Eurytoma hordei*, *fulvipes*, *tritici* and *secalis*, the larvæ of which infest wheat-stalks, and are well known in America under the name of the "joint-worm"; and I have described and figured, in the 'Gardener's Chronicle,' 1869, p. 1230, a species of *Eurytoma* which feeds upon and destroys the bulbs of a Brazilian *Cattleya*. Hence M. Coquerel had no hesitation, in describing the female of one of his fig-insects, to give it the name of *Chalcis ? explorator*, and it is impossible to compare his figure of that insect (*op. cit.*, Pl. x., fig. 4), or mine of *Sycophaga crassipes* (Pl. ii., fig. 2), with a female *Callimome* and not be convinced that the fig-species are most closely related to *Callimome* (many of the species of which are parasites on some of the gall-making *Cynipidæ*); the structure of the antennæ (even to the minute articulations following the second joint), the fusion of the three terminal joints of these organs, the structure of the wings and wing-veins, and the long exserted straight ovipositor, sufficiently prove that these insects must be placed in the great family *Chalcididæ*. These characters also seem to me to forbid the union of the fig-insects with the *Ichneumonidæ*, which have long, multiarticulate, straight, equal-jointed, antennæ, more strongly-veined wings, and of which the majority of the species are of a much larger size, together with the absence of metallic colours of the body (which is seen in some of the fig-insects); whilst none of the *Ichneumonidæ*, I believe, are known to be otherwise than parasitic on other insects.

Mr. Walker, in his 'Notes on *Chalcidiæ*' (as he terms the *Chalcididæ*), has adopted (without acknowledgment) my opinion of the relation of these insects with *Agaon*, and has formed them into an uncharacterised family, *Agaonidæ*. He speaks of them (p. 59) as the "most rudimentary form of the tribe, or the earliest created among them, or the first 'won from the void and formless infinite.'" He adds that Coquerel supposed that they have their place next to *Scleroderma*, which, he affirms, has "no near affinity with the *Bethylidæ*, and which has been supposed by some to belong to the *Mutillidæ*, and by others to be the female of *Myzine*. It has some resemblance to the female Australian and South American *Thynni*, and by these connections the primitive and semichaotic forms discovered by Dr.

Coquerel expand into the numerous and powerful tribe of Aculeate Hymenoptera, surpassing other insects in intellect, of which the wasp and the bee are the most familiar examples, though a great part control other orders of insects by using them as food for their young"! A relation with *Typhlopone* and *Dichthadia* is then suggested, "and thereby the multitudinous tribe of ants, whose economy is so remarkable, emerges from the blind and radical *Apocryptæ* and *Sycocryptæ*, the perpetual dwellers in the interior of figs. But the affinity of these two genera to the *Chalcidiæ* is more evident, and appears by several connecting links in the *Agaonidæ*; and thus the near relations to the general ancestors of the thousands, and perhaps tens of thousands, of the *Chalcidiæ* species, the tribe being considered in unity, are cradled in figs"!! Believers in the doctrine of evolution may well pray to be defended from such friends as the writer of these passages.

Mr. Walker has described several new genera of fig-insects from Hindostan, observed in the fruit of *Ficus indica* by Sir Walter Elliot, one of which is asserted to resemble "some Hymenoptera and *Termes*, or the white ant, in having a working class as well as males and females." This is probably the species which he next describes under the name of *Sycobia bethyloides*, giving separate descriptions of the female and "neuter?, worker?" He gives no description of the male; and as he was ignorant of the connection between the sexes of the already described species of fig-insects, I apprehend that his neuters or workers are in reality wingless males of a distinct group.

Sycophaga crassipes. (Plates II. and III.)

Westw., Trans. Ent. Soc. Lond. ii., p. 222.

Of this species both sexes have been received in considerable numbers from Egypt, infesting the seeds of *Ficus Sycomorus*, by Sir Sidney S. Saunders.

Description of the male.—The males are long, narrow, subdepressed insects having much the appearance of a small pale-coloured species of *Staphylinidæ* without elytra or wings, and with a pair of elongated setose anal appendages. The head is oblong, depressed, with the sides parallel; the anterior margin of the upper side of

the head has a deflexed point, whilst its front margin on the lower side has a deep impression on each side, within which the mandibles are affixed (Plate II., figs. 10, 11; and Plate III., fig. 12). In the second of these figures the buccal opening is seen, looking obliquely into the mouth; near the base of each of the antennæ is a black patch, which cannot be regarded as the rudimental eyes; and there are five dark-coloured longitudinal narrow streaks running along the whole length of the head.

The eyes are entirely wanting in the males, nor have I been able to detect any rudiment of the maxillæ and labium or palpi.

The mandibles, on the contrary, are very powerful, horny, trigonate, with the apex acute and curved, and the inner margin armed with two sharp conical teeth. The antennæ are very short, not one-third of the length of the head, composed apparently of only three joints, the basal one very large, broadly ovate and depressed, the second very small and obconic, and the third ovate-conic, apparently formed of three anchylosed joints, the first indicated by two rather strong but minute bristles, and the third apparently being a sort of very minute terminal nipple (see figs. 10, 12, and 14). The base of the head has a small transverse horny subovate kind of socket, by which it is attached in the cavity of the anterior margin of the prothorax.

The prothorax is nearly equal in size to the head, with the anterior angles rounded off; on the under side it is shortened for the insertion of the basal joint of the fore legs; the meso- and metathorax together are rather larger than the prothorax. The mesothorax is somewhat shield-shaped, truncated at its extremity on the upper side between the coxæ of the middle legs; it has a depression across its centre, an impressed line running from its base to join this impression. The metathorax is shorter, more transverse, with the sides rounded, the posterior angles removed in order to allow the insertion of the posterior coxæ. These segments exhibit no traces of elytra or wings. The legs are all short and very robust; as their structure affords specific distinctions with reference to other species of fig-insects (of which I possess a considerable number from different species of Indian and Ceylonese figs) I have been very careful in giving correct representations of them; the various figures in the plates illustrating this paper having been

made by the camera and reduced to a scale. The fore legs are represented in fig. 19, the middle ones in fig. 20, and the hind ones in fig. 21.

The coxæ in all these legs are very large, flattened, and oval in form, the trochanters very small, the femora large, flattened, and ovate; the tibiæ are about the length of the femora, armed beyond the middle and at the extremity with a number of short strong spines; the tarsi are five-jointed, the four basal joints very short, the fifth longer, subclavate, and the ungues are strong, the base of each on the inner edge being dilated and flattened. A minute pulvillus exists between the ungues, but is concealed by the dilated bases of the latter. The abdomen is elongated, flattened, very movable, the joints having the posterior margin produced on each side into an acute point, allowing much lateral motion in this part of the body. It is composed of seven joints, the first of which is small in consequence of the dilatation of the posterior coxæ. The terminal segment has the middle of its hind margin rounded, slightly produced backwards and entire (figs. 8 and 15), and is armed with two elongated villose cerci destitute of articulations, each terminating in an acute point. The base of each of these cerci is internally in communication with a gigantic trachea, which, in transparently mounted specimens, may be traced backwards as far as the prothorax. The male organs of generation are generally retracted within the extremity of the abdomen, as shown in figs. 1, 8, and 15, in which they are represented as seen in transparently mounted individuals; in figs. 16 and 17 these organs are exserted, and are seen to consist of a very slender tube, which is armed with two very minute genital claspers or oblong flattened appendages, having three or four exceedingly small curved teeth at their extremity; (fig. 18 represents the extremity of one of these claspers with three of its little teeth).

Description of the female.—The female *Sycophaga* is represented in fig. 2, drawn by camera from a living specimen sitting quietly on the under side of the glass cover of the little box in which it was placed. Its various parts are therefore represented in their proper relative proportions, which is desirable to be borne in mind whilst comparing this figure with the original representation of the upper side of the female in Trans. Ent.

Soc. Lond. ii., Pl. xx., fig. 5. The head is semiovate, subconvex, having an occipital groove down the centre. The eyes are of moderate size, near the posterior angles of the head. I have not detected the ocelli. The mandibles are small, subtrigonate, the apex curved and acute, and the base dilated externally. The other inferior parts of the mouth are represented in my former plate in vol. ii.

The antennæ are rather longer than the head, and consist of a large basal joint, the second being about half the length of the preceding, and affixed in an elbowed position; the third joint is very minute; the fourth is much smaller either than the second or fifth, which latter, with the five following nearly equal-sized joints are slightly thickened to the last, and the three terminal joints are more closely soldered together (as in the majority of the *Chalcididæ*), the terminal joint having several minute bristles just below its apex, which is subconical (figs. 5 and 6). The thorax is oblong-ovate, the prothoracic collar large and somewhat trigonate and subdepressed. The wings extend beyond the extremity of the body; the fore wings with the ordinary deflexed cubitus subclavate, and descending rather obliquely into the disc of the wing (fig. 7). The legs are of moderate length, the anterior (fig. 22) and the posterior (fig. 24) having the femora very much thickened, with the tibiæ very short, terminating in strong curved spines, and armed with elongated calcaria, which are bifid at the tip in the anterior legs. The middle pair of legs (fig. 23) in this sex are longer and much more slender than any of the others, with long tibiæ and tarsi, the former having a long, slender, acute calcar. The tarsi are twice the length of the tibiæ in the fore and hind legs, whilst they are equal in length to them in the middle feet. The abdomen is carinated beneath, not quite so broad as the thorax, and the ovipositor is as long as the thorax and abdomen united.

In figs. 3 and 4 I have represented two incidents in the lives of these insects of considerable interest. Fig. 3 shows the terminal portion of the body of a male, of which the head and thorax have penetrated into one of the fig-seeds in search of the enclosed female; whilst in fig. 4 I have represented the female in the act of escaping from the seed in which it has been reared (the aperture of which has been artificially widened to show the position of the enclosed female, of which the three

filaments of the ovipositor are seen to be curled under the body, and to extend in front of and backwards over the head).

Blastophaga Psenes. (Plates IV. and V.)

Cynips Psenes, Linn., Syst. Nat. i., p. 919.
C. Sycomori, Linn. Mus. (*ex parte*); Westw., Trans. Ent. Soc. Lond vol. ii., p. 221 (*Blastophaga Sycomori*).
Blastophaga grossorum, Gravenhorst.

Description of the male.—Specimens of the males of this species were preserved with the females in the Linnean Cabinet, agreeing with the specimens reared from Corfu and Montpellier figs by Sir Sidney Saunders, which have afforded me the means of supplying so extensive a series of illustrations of this most anomalous creature. It is about a line long, and of a fulvous colour, so that it is with difficulty observed lying amongst the seeds of the fig of *Ficus Carica*. Fig. 32 shows the general appearance of the insect, with the extremity of its body curved beneath the breast; fig. 33 represents it more magnified, and lying a little on one side; fig. 34 shows the abdomen stretched out horizontally; and fig. 35 the same part, with all the very retractile segments of the male organ extended to their full length, drawn from a living specimen.

The head is small and rounded, with two black lateral nearly rounded eyes; the front margin of the head is truncated, with an angular impression in the centre.

The mandibles are small, but strong and subquadrate, with two acute teeth at the apex (fig. 42). The other parts of the mouth appear to be entirely wanting.

The antennæ are very small (fig. 50), and consist of three joints, of which the first and second are obconic and nearly equal in size, the second having its basal portion on the inside more emarginate; the terminal joint is ovate, with a number of small bristles near the apex. The thorax is rather oblong, convex, with the prothoracic portion or collar very large; the mesothorax narrow and short; the metathorax longer, transverse, with a deep impression on each side (apparently to allow the upward free motion of the posterior coxæ), and with a spiracle distinctly visible behind each lateral impression.

There is not the slightest trace of wings or wing-

covers. The legs are varied in structure; the anterior (fig. 37) are very short, but very robust, with the thighs greatly swollen, the tibiæ very short and subtrigonate, the apical angles produced into curved spines; the fore tarsi are also very short, with two basal joints of minute size closely soldered together, the terminal joint clavate, with the ungues very robust, each armed with a strong tooth on the inside. The middle legs (fig. 38), on the contrary, are long and slender, with the joints of the normal size, the tarsi long and composed of five well-defined joints; the hind legs (fig. 39) have the femora and tibiæ thickened, resembling those of the fore legs, but the tarsi are twice the length of the tibiæ and five-jointed, with strong terminal ungues. The abdomen is convex, rather wider than the thorax, with three large basal joints; the following being gradually narrowed and ordinarily bent beneath the thorax (figs. 34 and 35). In fig. 34, which is drawn from a transparently-mounted individual, the male genital organ is seen to be retracted within the abdomen nearly throughout its entire length. In fig. 36 the extremity of the male organ is detached, the apex of the penetrating portion slightly bifid, and extending beyond the extremity of the preceding tubular portion.

The pair of minute claspers seen in the male of *Sycophaga* were not observed in the male *Blastophaga*.

Description of the female.—Referring to the general description of this sex given in my former paper, various additional details merit attention. The head (fig. 40) is nearly round, with the eyes large and strongly granulated. The mandibles (fig. 46), seen sideways, are affixed as usual, and are opened and closed by the ordinary muscles at the basal angle. The large serrated appendages described as palpi by Gravenhorst are not separately movable, not being articulated at the point of their connection with the base of the mandibles; consequently, when the mandibles close, the appendages (which lie flat on the under side of the head) are projected more obliquely towards the sides of the head, and when the mandibles are opened the appendages are brought nearer together, the serratures on the appendages thus probably acting as files or saws in assisting the insect in escaping through the opening which it has commenced making through the walls of the pericarp of the fig in which it has been reared.

In figs. 40, 45, and 47 the maxillæ (which are represented as detached, and seen in two different positions in figs. 48 and 49), are seen to protect the middle part of the lower mouth organ or labium, which arises from an elongated slender mentum, and is apparently articulated in its middle; the organs extend backwards almost to the base of the head (fig. 40), and are protected by two auxiliary corresponding pieces, which ordinarily stand upright (vertically), but which are seen in the figure lying flat, the one on the left side being partially hidden by the serrated appendage of the mandible on that side of the head; these are also seen in fig. 45 extending as far back as the base of the head. I have never met with any similar pieces in any other insect, and cannot conjecture what may be their analogous structure or use, except as defences of the delicate lower parts of the mouth. Fig. 41 represents the upper side of the head of the female, with the antennæ and mandibles removed, showing the central deflexed point of the clypeus, the ocelli, and the two black hastate spine-like spots near the insertion of the antennæ. Fig. 43 shows part of the front of the head of the female, with the mandibles and antennæ removed, exhibiting the notched sockets on each side for the insertion of the base of the mandibles. Fig. 44 shows the deflexed anterior margin of the clypeus.

The antennæ in this sex (fig. 51) are of moderate length, the basal joint being robust and somewhat conical; the second joint of moderate size, much narrowed at the base; the third joint very small, as is also the fourth, but this latter is furnished with a subulated lobe on its outer edge; the eight remaining joints are distinct, and nearly of equal size and thickness, the three terminal ones not being soldered into a mass, as in many *Chalcididæ*.

The fore wings are of large size, with the cubitus rather obliquely deflexed into the disc of the wing (fig. 52). The legs are unequal in size and form; the fore legs are robust (fig. 54), with a strong femur, very short thickened tibia, and long five-jointed tarsus, with strong curved ungues, and a large pulvillus; the middle legs (fig. 55) are of the ordinary form, the femora slightly thickened in the middle, the tibiæ long and slender, and the tarsus as long as the tibia, with a still larger pulvillus; the hind legs (fig. 56) have the femur short and much dilated

towards its base; the tibia very short, armed at its extremity with a large tridentate calcar, and the tarsus resembling that of the fore leg.

The abdomen is compressed, with the ovipositor extending about one-third of its length beyond the extremity. Its composition is shown in fig. 53, where the parts have been separated by pressure. The basal portions of its component parts are thus seen to be semicircularly curved and dilated; this is especially the case with the two slender lateral sheaths, which are a little dilated and twisted in the middle, the tips being obtuse and finely setose; whilst the central spicula is acute at the tip, with its middle portion resting within the bifid terminal ventral segment of the abdomen.

My figures 25 to 31 illustrate certain interesting points in the economy of this remarkable insect. Fig. 25 represents the fig of *Ficus Carica* from Corfu and Montpellier. Fig. 26 represents the minute, white, fleshy, larva taken from within one of the seeds of this fig. Fig. 27 represents the female pupa taken from the interior of a fig-seed, and fig. 28 the pupa of a male. Fig. 29 represents the female pupa rolled up within the seed; fig. 30 a female escaping from one of the seeds in which she had been reared; and fig. 31 represents a male exserting his generative organ into a fig-seed which contained the female insect.

Explanation of Plates.

PLATE II.

Fig. 1. *Sycophaga crassipes* male, magnified.
2. ,, ,, female, magnified.
3. Male penetrating a pericarp of the fig.
4. Female escaping from a pericarp of fig.
5. Antenna of female.
6. Second and following joints of ditto.
7. Part of fore margin of fore wing of female.
8. Extremity of body of male seen transparently, showing the great tracheæ.
9. Extremity of anal filaments of male.
10. Front of head of male from above, with mandibles removed.
11. Front of head of male from below, with mandibles removed.

PLATE III.

Fig. 12. Front of head of male *Sycophaga*, with antennæ and mandibles *in situ*, seen from below.
13. A mandible and base of antenna of male, from below.
14. Antenna of male, from below.
15. Extremity of abdomen of male, with penis retracted.
16 and 17. Ditto, with penis more or less exserted.
18. Three of the curved spines of the male claspers.
19. Fore leg of male.
20. Mesothorax and middle leg of male.
21. Hind leg of male.
22. Fore leg of female.
23. Middle leg of female.
24. Hind leg of female.

PLATE IV.

25. Fig of *Ficus Carica*, natural size.
26. Larva of *Blastophaga grossorum*, Grav., from Montpellier, highly magnified.
27. Pupa of female. From Corfu.
28. Pupa of male of ditto. From Corfu.
29. Pupa of female of ditto within a pericarp of the fig.
30. Female of ditto escaping from a pericarp.
31. Male of ditto introducing the extremity of its generative organs into a pericarp.
32. Male of ditto seen from above.
33. Ditto, more strongly magnified, seen sideways.
34. Abdomen of ditto, with the male organ entirely retracted, drawn from mounted specimen (seen transparently).
35. Abdomen of ditto, with the male organ fully protruded, drawn from living specimen.
36. Extremity of the male organ, detached.
37. Fore leg of male, highly magnified.
38. Middle leg of ditto.
39. Hind leg of ditto.

PLATE V.

40. Head of female *Blastophaga*, seen from beneath, with mandibles and one appendage *in situ*.
41. Ditto, seen from above, with mandibles and antennæ removed.
42. Part of front of head of male and one mandible.
43. Part of front of head of female with the mandibles removed, showing the notched socket on each side for insertion of base of mandibles.

Fig. 44. Deflexed point in front of clypeus.

45. Lower parts of the mouth of female, with the two corneous vertical basal appendages flattened by compression.

46. One of the mandibles and its serrated appendage, seen laterally.

47. Maxilla and labium.

48, 49. Maxillæ seen in different positions.

50. Antenna of male.

51. Antenna of female.

52. Part of fore margin of fore wing of female.

53. Abdomen of female compressed to show the structure of the ovipositor.

54. Fore leg of female.

55. Middle leg of female.

56. Hind leg of female.

IV. *On the classification of the* Adephaga, *or carnivorous series of* Coleoptera. By D. Sharp.

[Read February 1st, 1882.]

It is now more than twenty years since Leconte, writing on the classification of the *Carabidæ* (Class. Col. N. Amer., p. 5), said:—"Numerous efforts have been made to indicate a rational distribution of the genera, and the attempts commenced by Latreille and Bonelli, and successively improved by the suggestions of Dejean, Erichson, Schiödte, Lacordaire, and myself, have finally, in the expert hands of Schaum, assumed a form in which probably permanent results have been attained."

The learned and energetic American expert had himself contributed greatly—probably as much or more than any other of the talented entomologists he mentions—to the rational system of classification he describes, and had no doubt done so at the expense of great labour and time, and it was but natural that he should speak with confidence of results so legitimately obtained; but the lapse of time has not altogether justified his expression of reliance as to the permanency of the results then reached.

Duval, Chaudoir, C. J. Thomson, and other naturalists have worked since Leconte at the classification of these insects, and each has contributed more or less to knowledge, and has thus induced change. The genera of a large number of groups have been entirely remodelled by Chaudoir, whose recent decease has deprived us of one of the most indefatigable and useful of entomologists; while of the larger groups it may be truly said that at present but little accord exists as to their limits and arrangement, except in the case of certain comparatively small and isolated groups. And in point of fact we have learned that the natural classification of insects is a prodigiously complex and difficult affair; and at the same time the introduction of the theory of evolution has added much to the importance of the subject, and has helped to make it appear worthy of renewed efforts,

it being clear that our systems of classification will ultimately be appealed to as one of the modes of testing the *à priori* probability of organic evolution. Hence it is no matter for surprise that the subject is still of interest, and that it has recently received a fresh consideration from Dr. George Horn, who has already proved himself a worthy assistant of Leconte and his predecessors. In the Transactions of the American Entomological Society for July 1881, Dr. Horn has given us a paper extending to one hundred pages, illustrated by eight useful plates, wherein he has proposed a system of forty-eight tribes for the *Carabidæ*, and has prefaced his paper with a proposal for a modified arrangement of the carnivorous families of Coleoptera. This latter question is of course a still larger and more difficult one than that of the arrangement of the members of the *Carabidæ*, and I should not feel justified in expressing my opinion on it, except that I have recently required to devote some attention to the subject in connection with my work on the *Dytiscidæ*—one of the carnivorous families—now in course of publication by the Royal Dublin Society.

In his treatment of the *Carabidæ* Dr. Horn has made a decided improvement by adopting three subfamilies, viz., *Carabinæ*, *Harpalinæ*, and *Pseudomorphinæ*, instead of two, viz., *Carabinæ and Harpalinæ*, as has been heretofore done. These subfamilies are limited primarily by the structure of the middle coxal cavities, a character that is found by experience to be of primary importance in the carnivorous series, and is indeed of very great importance and assistance throughout the whole order of beetles. About a year and a half ago I published a preliminary notice on the classification of the *Dytiscidæ* (Comptes-rendus Soc. Ent. Belg., xxiii. p. cli), and pointed out that one of the two series of this family differed from the other series, and, so far as was then known, from all *Carabidæ* and other Coleoptera, by the fact that the metathoracic episternum, as well as three other pieces of the sternum, entered into the composition of the articular cavities of the middle legs. Dr. Horn has now made the interesting discovery that in a single genus of the *Carabidæ* a similar structure prevails: that genus is *Mormolyce*. Now *Mormolyce* has been known for a number of years as one of the wonders of the insect world, and so extraordinary is it in appearance,

and so totally different in this respect from any other Carabid, that it stands unique to the eye; and when to this extraordinary facies is added the important fact that it departs from all other *Carabidæ* by the primary point of structure already mentioned, and agrees therein with the *Dytisci complicati*, to which, however, it has no other point of resemblance, it is evident that we have in *Mormolyce* an extremely isolated organism. Dr. Horn (*op. cit.*, p. 150) points out the want of agreement that has prevailed as to its position even before his discovery of its extraordinary cotyloid peculiarity. Under these circumstances it appears to me very strange that the talented American has not had the courage of his convictions, or rather of his discovery, and isolated *Mormolyce* in his classification, as it is in nature. He has not, however, done so, but has adopted the illogical course of disregarding his own discovery, and placing *Mormolyce* in the *Harpalinæ*, although the one character by which *Harpalinæ* are distinguished from *Carabinæ* is that "the middle coxal cavities are entirely closed by the sterna, the epimeron not attaining the coxa," and although in *Mormolyce* the middle coxal cavities are not entirely closed by the sterna, and the epimeron (and metathoracic episternum also) does attain the coxa. To put it more briefly, the *Harpalinæ* are separated from the *Carabinæ* by a difference in the cotyloid structure; *Mormolyce* departs from the *Harpalinæ* in this respect a good deal more strongly than do the *Carabinæ*, and yet is classed with the *Harpalinæ*. This course appears to me a very erroneous one; indeed I fail to see how classification can ever be of scientific value while subject to such treatment. It is true that if *Mormolyce* were connected with the *Harpalinæ* by a series of intermediate forms, there might then be some reason for connecting it with them, in spite of the cotyloid structure; but, as is abundantly clear from Dr. Horn's careful study of its characters, this is not the case, and I think *Mormolyce* should therefore not be connected with the *Harpalinæ*.

I quite agree with Dr. Horn in his separation of the *Pseudomorphinæ* from the other members of the *Harpalinæ*; in this he has done well, for the group is a natural one in the sense that all its members are clearly allied together, while it is, I believe, perfectly distinct by well-marked characters, and by the absence of intermediate

forms. Some of the older entomologists appear to have supposed, indeed, that the insects forming this subfamily were more allied to the *Dytiscidæ* and *Gyrinidæ* than to the *Carabidæ*, but detailed investigation has not supported this view, and the only position that can be correctly assigned to the *Pseudomorphini* in the present state of our knowledge is that given them by Dr. Horn, and already previously indicated by Duval (Gen. Col., *Carabidæ*, p. 47). There is, however, a question with regard to the group that has not, so far as I am aware, been yet investigated, *viz.*, whether any approximation exists between the group and the *Paussidæ*; and I mention this as an interesting subject for inquiry.

The family *Carabidæ* is at present composed as follows :—

75 species = 5 genera = (? 2) tribes = *Pseudomorphinæ*.
8000 species = 500 genera = (? 31) tribes = *Harpalinæ*.
1800 species = 100 genera = 15 tribes = *Carabinæ*.
3 species = *Mormolyce*. . . . .

} *Carabidæ*.

It will, I hope, be understood that the above tabulation is merely an approximation to the actual numbers, but it will be found sufficiently near the mark to allow us to detect some interesting statistical facts. Thus the average number of species to a genus in each of the three subfamilies is very nearly the same, being respectively 15, 16, 18; on the other hand, the average number of genera in each tribe is extremely different, being respectively 2·5, 16, and 6·75. I shall here content myself with pointing this out, and refrain from entering on any speculations about it. As regards the number of tribes, or aggregates immediately subordinate in complexness to the subfamily, I must however remark that their number is quite uncertain, and will probably prove to be considerably greater than that given by Dr. Horn, and approximately adopted above, for Dr. Horn's studies have been made chiefly on the North American forms, and the vast mass of exotic forms unknown to him would probably cause a considerable increase in the number of these tribes. No doubt also much additional consideration as to the limits and affinities of those proposed by the American writer will be necessary before

they can be accepted. In the case of the *Siagonini*, for instance, Horn departs from the views of Chaudoir as to the mesosternal structure, and states that the middle coxal cavities are closed externally by the junction of the middle pieces of the meso- and meta-thoraces, and that Schiödte, Schaum, and Chaudoir have been deceived in their supposition that these pieces are separated by the interposition of the mesothoracic epimeron. To determine this he relies on macerating the specimen in caustic potash, but this appears to me a very unsafe proceeding,—and for this reason,—the mesosternum of *Siagona* is a very peculiar one, and the pieces forming it are all soldered together, but they are traversed by some prominent ridges, along which the chitinous substance is very much thicker than elsewhere, and these ridges may longer resist the action of the potash, and so give rise to a deceptive appearance of sutures; moreover, after having made a special dissection of the largest *Siagona* (*S. dejeani*) and removed the metathoracic episternum, it appears to me clear that the suture separating the middle piece of the mesosternum from the side piece can be undoubtedly traced, and that Chaudoir, Schaum, and Schiödte were correct in considering that the mesothoracic epimeron separates the middle sternal pieces. I think, therefore, we should be reluctant to accept the evidence of preparations that have passed through so serious an ordeal as that of maceration in caustic potash, in opposition to the direct evidence from unaltered specimens.

In the case of many of the tribes Dr. Horn adopts, he makes use of the same names for them as have been used by his predecessors, although giving to those names a widely different extension or meaning. This plan is that usually adopted by zoologists, but it is accompanied by the great disadvantage that it gives to classifications a false appearance of accord and permanence, and also, by giving to the names the sanction of long use, tends to make them appear in the eyes of many of more importance than they are in fact. Indeed, I myself am of opinion that classification of the groups superior in complexness to genera is at present so extremely far from approximation to the actual facts, and that these groups will thus probably in future assume a totally different form, that we should do well to refrain from giving them names at all, contenting ourselves with the simple

method of numbering the tribes, groups, &c., instead of naming them.

I had intended making a comparison of Dr. Horn's tribes with those used by C. J. Thomson and Duval, but this I find to be impossible owing to the fact that the tribes of these authors consist of European insects, while Horn's are made chiefly on the North American fauna; moreover, as I have already stated, the same names do duty for very different values; thus these two facts render any positive comparison almost impossible.

In considering the families composing the carnivorous series, Dr. Horn adopts no less than seven families, *Cicindelidæ*, *Carabidæ*, *Haliplidæ*, *Amphizoidæ*, *Pelobiidæ*, *Dytiscidæ*, and *Gyrinidæ*. The first reflection about these families which occurs to one acquainted with the subject, is that they are of extremely different values; thus the word *Cicindelidæ* represents about 1000 species and forty genera; the word *Carabidæ* about 10,000 species of 600 genera; the word *Haliplidæ* about fifty species of three genera; *Amphizoidæ* two or three very closely allied species; *Pelobiidæ* two or three species; *Dytiscidæ* about 1200 species arranged in eighty genera; and *Gyrinidæ* 150 species of seven or eight genera. Here again Dr. Horn follows the system in vogue, and it is that system we must blame if we consider that this process of making single species appear the zoological equivalent of ten or twenty thousand species is an erroneous one. There is, however, an important fact indicated by this nomenclature, *viz.*, that certain species are as distinct in their structure from the great complex masses of species, as these latter are from one another; in this sense we see that the isolation as regards intermediate forms of a single species may be as great as that of ten thousand species from another ten thousand species. This is a fact of great importance, and it is clear that a method of nomenclature and classification that reveals instead of concealing these facts is a great improvement. A purely synthetical classification gives us these advantages; under it *Amphizoa insolens* would not be "a family," but would remain in classification an isolated creature until the synthesis of family value were reached. Putting aside, however, this technical objection, for which, as I have said already, Dr. Horn is in no sense exclusively responsible, we may

look, I think, upon Dr. Horn's families as natural ones. The distinction between the *Cicindelidæ* and *Carabidæ* long puzzled entomologists, and a few years ago the opinion of naturalists seemed to tend to uniting them as only one family, but the remarkable structure of the parts of the buccal cavity in the *Cicindelidæ* always left doubts as to the propriety of this course; and since Dr. Leconte pointed out that in addition to the mouth-differences there existed an important difference in the structure of the head, the general feeling has been to keep them as quite distinct aggregates. Dr. Leconte defined the difference between the two families in terms of the insertion of the antennæ, and this is repeated by Dr. Horn, who states that *Cicindelidæ* have "antennæ inserted on the front above the base of the mandibles," while the *Carabidæ* have "antennæ arising at the side of the head between the base of the mandibles and the eyes": this definition is not, however, a very good one, for there are certain *Carabidæ* which approximate much in this respect to the *Cicindelidæ* (cf. *Loricera*), and some, at any rate such as *Trichognathus*, that this definition would bring into the *Cicindelidæ*. Fortunately, however, it can be replaced by a formula that is, I believe, quite exact, and even more easily appreciated, viz., *Cicindelidæ*, "clypeus extending laterally in front of the insertion of the antennæ"; *Carabidæ*, "clypeus not extending so far towards the sides as the insertion of the antennæ."

As regards the separation of the *Haliplini* from the *Dytiscidæ*, and its treatment as a distinct aggregate, there is, I think, no reason to doubt this being a natural proceeding. So also as regards *Pelobius*; I have already expressed my opinion that it should not be left in the *Dytiscidæ*; and as it is not allied to any Carabid, Dr. Horn is probably justified in isolating it.

In discussing *Amphizoa* (Tr. Roy. Dub. Soc., n. s., vol. ii., p. 844), I expressed the opinion that it might be treated as an aberrant member of the *Dytiscidæ*, this view being largely derived from the fact that the *Dytiscidæ* were the only Coleoptera known to possess a structure of the middle coxal cavity similar to what exists in *Amphizoa*. This was, however, before Dr. Horn had benefitted us by his important discovery that *Mormolyce*—an undoubted member of the *Carabidæ*—likewise possesses this same structure. This introduces

quite a new, and a most important, factor into the treatment of this problem, and, seeing that *Amphizoa* agrees with certain *Carabidæ* as well as with most of the *Dytiscidæ* by the peculiarity I have alluded to, I think it will be a quite natural course to treat it as an aggregate (not as a family) occupying an intermediate position between *Carabidæ* and *Dytiscidæ*, but a member of neither.

The last family placed by Dr. Horn in the Adephagous or Carnivorous series is the *Gyrinidæ*, and at the end of his memoir (p. 187) he has placed a special short note, in which he states that "the structure of the external skeleton, as well as the mouth parts, seem to be so plainly adephagous as to leave no room for doubt." This rather positive affirmation is, however, scarcely justified by the definition and facts Dr. Horn gives us at the commencement of his essay, where he tells us (*op. cit.*, p. 91), "the adephagous series of Coleoptera is readily recognised by the predaceous character of its mouth parts, its slender antennæ (except in *Gyrinidæ*), pentamerous tarsi, and the structure of the first abdominal segment, which is in all cases divided or hidden by the posterior coxæ in such a manner that it is entirely lateral, rarely appearing as a small triangular piece between the posterior coxæ." Thus we are presented with four characters as justifying the introduction of an aggregate into the Carnivorous series, and a little consideration will show that by none of these characters is the place of the family *Gyrinidæ* indicated as being clearly in the series in question. 1st. As regards the mouth, it is well known that the trophi of *Gyrinidæ* depart very widely indeed from the *Carabidæ* and *Cicindelidæ*, the lower lip is of very much inferior development, and only to a slight extent of the predaceous type, and the maxillæ are either entirely destitute of the outer lobe, or when it is present, possess it undivided, and thus this family is very far indeed from agreeing with the other Carnivori in the mouth structure. 2nd. As regards the antennæ, nothing can well be more different from the setaceous or filiform adephagous antenna than is the highly peculiar antennal organ of the *Gyrinidæ*; but as Dr. Horn himself alludes to the fact that the *Gyrinidæ* are an exception in this respect, it is useless to deal more at length with this point. 3rd. The pentamerous tarsi: though the *Adephaga* possess generally (but not always,

vide *Hydroporides*) five-jointed tarsi, yet so also do a vast number of other Coleoptera not included in the *Adephaga*; and we cannot therefore take this into consideration, more especially when we recollect that the tarsi of *Gyrinidæ* are absolutely unique in their structure. 4th. The abdominal structure: in immediate sequence to the paragraph I have last quoted from Dr. Horn, there follows in his memoir another, in which he demonstrates that the ventral structure in *Gyrinidæ* is different from what prevails in the other families, and in point of fact it is undoubtedly the case that the *Gyrinidæ* have six ventral plates stretching quite across the under surface, and a seventh plate visible only on each side, while the true members of the adephagous series have five ventral plates extending all across the body, and a sixth visible only on each side. Thus in this character, as in all the others I have discussed, the *Gyrinidæ* depart from the other members of the adephagous series; and it is perfectly clear that the *Gyrinidæ* are not connected with any of the other components of the series by any characters of such immediate importance as connect these other components *inter se*. I think the *Gyrinidæ* will prove one of the most isolated of all the families of Coleoptera, and it is therefore not advisable to place them in a series, all of whose other components are linked together in the most intimate relations. I do not intend by this to deny that the *Gyrinidæ* may find their nearest allies in the *Adephaga*; that is quite another question from the above.

I must not pass from the consideration of Dr. Horn's paper without making some apology for the rather critical nature of my remarks, but this is scarcely necessary, for we all know that he is one of the most unprejudiced admirers of truth and accuracy, and I am convinced that he will no more be likely to find fault with me for discussing some of his conclusions than the lamented Chaudoir would have been to disagree with him because of his criticisms; but I cannot conclude without pointing out that, although we are still far from possessing a perfect classification of the carnivorous Coleoptera, yet Dr. Horn's paper shows that we are on the right road for getting one; and his contribution will undoubtedly prove to be a considerable assistance to those who, like himself, will have the courage and perseverance to aid research in this direction. Such a large amount of

original observation as is recorded in the definitions of the tribes and remarks on the subordinate groups and in the six plates closely filled with drawings of the trophi, cannot but be most useful to future systematists, and we may give our hearty thanks to Dr. Horn for the work he has accomplished.

Another paper on the classification of the Carnivorous Coleoptera has been recently published in the Deutsche Ent. Zeit. 24 (1880), pp. 258—280. It is by Herr Kolbe, and is entitled "Naturliches system der Carnivoren Coleoptera," and it is interesting to compare this with Dr. Horn's paper.

The author starts on the hypothesis that in distant geological periods water-beetles preceded land-beetles, that the land-beetles we now have are descended from water-beetles; and he consequently attaches great importance in his system to such points of structure as are common to water-beetles and certain land-beetles, such as a comparatively immobile prothorax and inferior development of the external sensitive structures of the antennæ. He starts with the "family Carnivora," which he defines, and which is synonymous with the "Adephagous series" of Horn, and is quite equivalent therewith, except that the German author has introduced into his family certain fossil insects which he treats as a subfamily, with the name *Escheriidæ*. His definition of the family is of very little service practically, owing to nearly the whole of the characters mentioned being subject to exceptions. And the family is then divided into six sections—1, the *Ephydrodephaga*, the equivalent of *Gyrinidæ* of other authors; 2, *Enhydrodephaga*, which equals the families *Dytiscidæ*, *Pelobiidæ*, and *Haliplidæ* of Horn. Up to this point there is little or nothing novel in Herr Kolbe's system, but from this point to the end the arrangement is very different from any in vogue. The 3rd section is called *Amphidephaga*, and consists of the single genus *Omophron*. The 4th section comprises *Amphizoa*, *Trachypachys*, *Carabidæ* (= *Notiophilini*, *Carabini*, *Cychrini*), and *Pamboridæ*, and is called *Heterodephaga*. Section 5, *Mesodephaga*, comprises the *Cicindelidæ*, *Elaphridæ*, *Metriidæ*, *Loriceridæ*, *Promecognathidæ*, *Hiletidæ*, *Scaritidæ*, *Escheriidæ* (fossil), *Siagonidæ*, *Ozænidæ*, *and Mormolycidæ*. While the 6th and last section, called *Holodephaga*, consists of all the

enormous mass of *Carabidæ* (including the *Pseudomorphidæ*), except those groups that have been placed in one or other of the preceding sections.

Herr Kolbe supplements this formal sketch with some remarks on the various sections and some of the subfamilies; some of his hints and suggestions will be found useful, but others are of a speculative rather than a practical character, and a future systematist who should pay much attention to these would be perhaps only confused.

To criticise at length this very original memoir would occupy me too long; it undoubtedly contains many suggestive comparisons, and indicates a considerable knowledge and much power of generalisation. But it is, as a natural system, completely erroneous, the author's hypothetical starting-point having caused him to attach undue importance to certain characters and to neglect others. Hence it is that he has reduced the *Cicindelidæ* to a mere subsection of his *Mesodephaga*, and has made a statement so illogical as that on p. 275, where he says that the peculiar insertion of the antennæ in the *Cicindelidæ* is merely a result of the enormous development of the mandibles; a conclusion which is contradicted by the fact that in the *Scaritidæ*, where the mandibular development is even greater than in the *Cicindelidæ*, the antennal insertion does not even approximate to that of the *Cicindelidæ*, but is more different therefrom than in the *Carabidæ*, with smaller mandibles; and by the fact that in *Trichognathus* and *Loricera*, where the antennal insertion approximates to that of the *Cicindelidæ*, the mandibles are unusually small.

Although we cannot look on Herr Kolbe's effort at a natural classification as successful, we nevertheless thank him for it; it is in fact very important that classification should be treated from various points of view, and every character receive its due share of attention, and thus any one who ventures far from the beaten track should be encouraged, for he is sure to bring to light something useful.

V. *On some New Zealand* Coleoptera. By D. Sharp.

[Read March 1st, 1882.]

A small parcel of Coleoptera, received a few weeks since by me from Mr. Helms, of Greymouth, New Zealand, has proved, on examination, to contain such a large proportion of new and interesting forms as to make me believe that it would be acceptable to entomologists that I should briefly define and record some of them. Hence the present paper.

The idea formerly universally accepted, to the effect that the New Zealand fauna is poor in insects, is now, so far as regards the order Coleoptera, shown to have been completely erroneous. Some 1400 or 1500 species of this order are now recorded from the islands in question, and yet a considerable proportion of the species found by Mr. Helms in the neighbourhood of his residence prove to be new. And there can, indeed, be little doubt but that the number of existing species in the islands will amount to three thousand, or even more,—not improbably nearer to four thousand.

Under these circumstances, the publication in 1880* of a Manual of New Zealand Coleoptera by the Colonial Museum and Geological Survey Department of the Colony, must clearly be characterised as premature, and has indeed been proved so by the additions of some hundreds of species made since its appearance. The volume contains descriptions of 1141 species, a considerable proportion of which are reprints of papers or works that have appeared elsewhere, many of them quite recently, while the remainder—to the number of fully 500—have been drawn up by Capt. Thomas Broun, whose skill and enthusiasm as a collector are deserving of the highest praise and warmest encouragement, but whose

* 'Manual of the New Zealand Coleoptera.' By Capt. Thomas Broun. Published by Command. Wellington, 1880.

qualifications as a systematic writer are unfortunately not substantiated by the work I am alluding to. Indeed so grave are the defects of the work in question that I feel sure all entomologists who, like myself, have given some attention to it, will share with me a feeling of regret that it should have been published in its present form. While expressing great satisfaction that the Colonial Museum Department of New Zealand should be able and willing to devote a small portion of the public funds to the promotion of a knowledge of the more obscure and neglected branches of Natural History, we must at the same time urge that some discretion should be used in its employment, and care should be taken as to the nature of the work produced. Dr. Hector, in a few words of preface, speaks of the work in question as "a monument of the zeal and industry of an ardent naturalist," and in so doing he expresses, I believe, a genuine feeling in which all will agree with him; but the zeal and industry of two or three years of human life are quite insufficient for the accomplishment of a large and arduous task in scientific research; while the results of encouraging any one to pursue a task whose accomplishment is beyond the means, the time and the material at his disposal, are sure to be unfortunate. Most haste less speed is an admirable saying, when a number of workers are engaged in a common task, and where the haste and confusion of one of the number may cause great delay in the progress of the whole band. This is eminently the case with the Manual of New Zealand Coleoptera: it is premature, it is totally useless to the uninitiated or unskilled entomologist, while to workers like myself, instead of being an assistance, it is an obstacle to the promotion of knowledge. The systematic portions of the work are abbreviated translations from Lacordaire's 'Genera of Coleoptera,' and they are useless for the purpose to which they are applied for two reasons: first, because they are extremely fragmentary, and are unaccompanied by the tables, which are a most useful and indispensable concomitant of Lacordaire's admittedly and necessarily artificial or imperfect classification; and second, because scarcely any New Zealand insects were known to Lacordaire, and had they been they would necessarily have modified his system; while, as matters stand, the New Zealand student will imbibe the unfortunate idea that there is something wrong about

the New Zealand beetles, for they do not seem to reflect credit on the classifications into which they are to be forced. While the work is thus premature and unfortunate in its conception, its execution is perhaps even more deficient. Taking as an instance almost the first page —the commencement of the Carabides on p. 6—we find the family commences with the group *Migadopidæ*, which is supposed to be characterised by the words, "Mesothoracic epimera not reaching the middle coxæ"; this is unfortunately exactly the opposite of the truth, and what should have been written was "Mesothoracic epimera reaching the middle coxæ." Even, however, if the writer had not fallen into this profound error of expression, and had given the definition correctly, it would have been quite insufficient and misleading, for in the definitions of the other groups of the family no mention whatever is made of this character; and thus, although the two first groups of New Zealand Carabides, viz., *Migadopidæ* and *Scaritidæ*, differ from all the other groups by the point alluded to, this fact is concealed, not expressed by the work in question. This is a fair sample of the mode of execution of the work. I find, as another example, the *Lucanidæ*, which I have had occasion to test specially, to be very deficient as regards the number of species recorded, the synonymy, and the referring of the older species to their correct genera; and if the *Lucanidæ* are in this state, what the condition of the more difficult groups may be can scarcely be imagined, but it is certainly very bad indeed; species belonging to previously-described genera are placed either in wrong old genera or in new genera, while a constant feeling of annoyance is occasioned by the fact that the original parts of the work are not distinguished from the reproduced parts, so that one never knows without collation, except by an inference which may or may not be correct, whether any particular passage is due to the author, or is a reproduction from some one else; and the pronoun "I" in the book means very various writers.

I make these remarks in no spirit of captious criticism; it would give me the most hearty pleasure to acknowledge a real increase of knowledge about New Zealand beetles, and to congratulate the Colonial Museum Department on assisting in the promotion of such knowledge, and it is in the hope that Captain

Broun will in future work "ohne Hast aber ohne Rast," and, by limiting his ambitious programme, increase his powers of useful performance, and so make a real addition to a knowledge of the New Zealand fauna, that I have felt it right to speak as above. Let him deal with each family separately, and give us a careful study of its New Zealand species.

That the New Zealand beetles are of great scientific importance, and that there is very great danger that a considerable proportion of them will be soon completely extirpated is certain; and intelligent beings, who will collect and carefully preserve the rarer forms are doing now a work which will be impossible in the future; and when the specimens are so collected and preserved, it is, and will be, a work of great magnitude and difficulty to study them and learn from them all that is to be learned: thus it is important that the earlier works on the subject should not encumber it with unnecessary difficulties, and so put preliminary obstacles in the way of future students; we shall never get beyond mere nomenclature if this be made so difficult as to claim all the powers and time the student has at his disposal.

As regards the forms described and characterised in the present memoir, I believe they will be found to make a real though slight addition to our knowledge; the existence in New Zealand of a genus of *Rhinomacerides*, and of two genera of true *Chrysomelidæ*, as well as of a genus of *Colydiidæ*, allied to the anomalous European *Langelandia*, and connecting it with the *Tarphii*, are facts of considerable importance and novelty; while, as regards the other forms, they will, I think, be easily recognised from my descriptions, although the certain position of one or two genera will be perhaps for some time a doubtful question. Certain of the species are described because they have already been more or less widely distributed under the names I have applied to them.

The following is a list of the genera and species :—

CARABIDÆ.
Scopodes nigrinus.
SILPHIDÆ.
Choleva lugubris.
TROGOSITIDÆ,
Grynoma regularis.
COLYDIIDÆ.
Tarphiomimus wollastoni.
Chorasus (n.g.) *subcæcus.*
Acosmetus reitteri.
BYRRHIDÆ.
Nosodendron zealandicum.
LUCANIDÆ.
Ceratognathus dispar.
SCARABÆIDÆ.
Sericospilus (n.g.) *advena.*
ANOBIIDÆ.
Mesanobium (n.g.) *debile.*
MALACODERMES.
Dasytes helmsi.
DASCILLIDÆ.
Cyphon variegatus.
ŒDEMERIDÆ.
Techmessa distans.
RHYNCOPHORA.
Rhinorhynchus (n g.) *zealandicus.*
Anagotus (n.g.) *helmsi.*
Pentarthrum helmsianum.
LONGICORNES.
Didymocantha robusta.
Somatidia helmsi.
Xylotoles huttoni.
Hybolasius deplanatus.
Tetrorœa sellata.
„ *discedens.*
Mesolamia (n.g.) *marmorata.*
PHYTOPHAGA.
Chalcolampra speculifera.
Allocharis (n.g.) *marginata.*

Scopodes nigrinus, n. s.

Gracilis, nigerrimus, subopacus, parum sculpturatus, antennis articulis 2—4 plus minusve testaceo-tinctis ; oculis valde prominulis ; thorace subtiliter strigoso, haud nitido, profunde canaliculato, angulis posterioribus obsoletissimis ; elytris irregulariter parum profunde striatis, versus suturam foveolis tribus parvulis. Long. 4 mm.

Head rather narrow for this genus, but the eyes excessively prominent, the space between them not great, somewhat finely, but very definitely, strigose. Thorax small, the surface only obsoletely strigose, with a channel along the middle, which, seen in one direction, appears very deep, and with anterior transverse depression, the front angles very rounded, the lateral margin very distinct, and bearing in front of the middle an angular prominence, behind this narrowed in a straight line to the base, and there the margin is very slightly turned inwards, becoming quite obsolete close to the angle. Elytra with the surface uneven, owing to indefinite striation, and with three very indistinct impressions near the base.

Greymouth ; No. 188, Helms.

Cholera lugubris, n. s.

Ovalis, posterius attenuatus, densissime subtilissimeque pubescens, opacus, niger, antennarum basi rufo-obscuro; vix perspicue punctatus, sed elytris confertim transversim strigulosis. Long. $2\frac{3}{4}$—$4\frac{1}{4}$ mm.

Antennæ rather longer than head and thorax, rather stout, a good deal thickened towards the apex; 7th joint rather longer than any of the others, rather longer than broad; 8th much smaller than the contiguous joints; 9th and 10th each about as long as broad. Thorax very finely punctured and pubescent, a good deal sinuate at the base on each side, so that the hind angles appear prolonged backwards. Elytra with a distinct sutural stria, and rather closely transversely strigose. Spurs of hind tibiæ elongate.

The male has the front and middle tarsi greatly dilated. The species apparently varies much in size.

Greymouth; Mr. Helms.

There can be no doubt that this insect is congeneric with *Cholera antipodum*, Kirsch, but whether it be so with our European species I cannot decide at present. *C. lugubris* resembles a good deal the European *C. coracina*, though very distinct by its sculpture.

Grynoma regularis, n. s.

Oblonga, subparallela, parum convexa, fuscula; elytris ferrugineo-variegatis; pube tenui erecta vestita; elytris pube albido-micante ornatis, punctis magnis fere seriatim dispositis sat distantibus. Long. $5\frac{1}{2}$ mm.

Of rather parallel and elongate form. Antennæ black. Head about half as broad as the thorax, its sculpture dense, but much concealed by an elongate pubescence. Thorax very transverse, twice as broad as long, the sides rounded, becoming a little broader from the front to near the base, and thence a good deal narrowed, the hind angles definite and not far from being rectangular; the surface densely sculptured, and pubescent like the head. Elytra nearly black, much variegated with pale red, and with a very conspicuous maculation caused by patches of shining white down; the surface bears large and deep round punctures; these are not close together, and are not altogether regularly arranged; from each springs a

slender, elongate, erect seta. Under surface and legs nearly black; tarsi obscure reddish.

Greymouth; No. 191, Helms.

This species is very readily distinguished from the others of the genus by its more elongate parallel form, and the very different elytral sculpture. It no doubt varies in colour to a considerable extent.

Tarphiomimus wollastoni, n. s.

Oblongus, superne valde inæqualis, squamulis subvariegatis dense vestitus; prothorace basi gracili, lateribus anterius explanatis, in lobis tribus divisis; pedibus sat gracilibus. Long. 4 mm.

This species is very similar to *T. indentatus*, Woll., but is perfectly distinct therefrom by some important minor points. The thorax has the sides divided in front into three lobes, the posterior fourth lobe seen in *T. indentatus* being here absent, and thus the basal portion of the prothorax appears more elongate and slender. The elytra are even more uneven than in *T. indentatus*, but their disc is flatter, owing to the fact that the irregular oblique elevation extending from about the middle of the suture directly towards the shoulder in *T. indentatus* is absent in *T. wollastoni*. The legs are considerably more slender in *T. wollastoni*.

Greymouth; No. 61, Helms.

Chorasus, n. g. (*Colydiidarum*).

Corpus subangustum, haud convexum, nudum. Antennæ breviusculæ, 10-articulatæ, articulo primo condito, clava abrupte biarticulata. Caput exsertum, oculi minuti, canalicula suboculari maxima. Prothorax subtus ad angulos anteriores maxime impresso. Prosternum magnum; coxæ minutæ, globosæ, sat distantes. Metasternum parum elongatum; coxæ intermediæ sat distantes, posticæ paulo magis distantes. Abdomen ex segmentis quinque subæqualibus compositum, suturis profundis. Pedes sat graciles, mutici; tarsi 4-articulati, haud elongati, articulo basali quam 2o paulo longiore, 2o et 3o brevibus, 4o quam ceteris paulo longiore.

The affinities of this little insect with the anomalous European *Langelandia* are undoubted; the antennæ and

head (including, so far as I can see, the parts of the mouth) are extremely similar in the two genera, except that the eyes are totally wanting in *Langelandia*, and are present, though extremely reduced in size, in *Chorasus*. The structure of the under surface is similar, except that in *Chorasus* the epipleuræ are broad and nearly horizontal, and the ventral segments are comparatively shorter. The tarsi are undoubtedly 4-jointed. The claim of *Langelandia* to be admitted into the *Colydiidæ* is absolutely confirmed by this most interesting insect.

Chorasus subcæcus, n. s.

Piceus, pedibus piceo-rufis, antennis rufis, opacus, quasi squamatim-granuloso, elytris longitudinaliter costatis; prothorace magno, margine anteriore utrinque profunde sinuato, in medio setuloso. Long. $2\frac{3}{4}$ mm.

Head with a comparatively shining space on the middle, impressed on either side of this. Thorax large, about as long as broad; owing to the deep sinuation on either side of the front margin, the middle has the appearance of being produced, and this prominent part bears closely-set, curled upwards, pale setæ; behind this is an indistinct longitudinal impression, and the surface shows a very peculiar sculpture, something like scales, or as if there had been tubercles shaved off. The elytra are scarcely twice as long as the thorax, and are somewhat narrowed behind, and a little truncate at the extremity; they bear a sculpture somewhat similar to that of the thorax, except that they are smaller, are less definite, and are suboblong instead of round; from the base there starts a rather sharply elevated longitudinal elevation, which extends two-thirds of the length, and external to this are one or more very much shorter and more indistinct elevations.

This creature is, notwithstanding its small size, one of the most interesting of Mr. Helms' discoveries at Greymouth.

Acosmetus reitteri, n. s.

Subquadratus, crassus, elytris elevatis, fusco-niger, superne in elytris tuberculis maximis et inæqualiter fulvo-tomentosus, setulisque erectis adspersus, antennis pedibusque rufis. Long. 4, lat. $2\frac{3}{5}$ mm.

Antennæ rather stout, quite red; club strongly tri-articulate. Thorax very uneven, sinuate on each side in front, so that the middle much covers the head, narrowed in front, the surface much hispid, especially at the sides, the side behind the middle divided by a deep transverse fissure; the part in front of this fissure is produced backwards, so as nearly or quite to touch the portion behind the fissure, and so as to leave internal to this point of contact a window or opening through the surface of the thorax, which however is frequently concealed by being filled up with an exudation, or with the vegetable substance amongst which the insect lives; in front of the hind angle the thorax is much narrowed, and the hind angle projects backwards as a large triangle. Elytra with very large and greatly elevated tubercles, which bear a coarse tomentum; between the tubercles are numerous, rather indefinite but large, punctures or pits, and the surface is also sprinkled with numerous conspicuous erect setæ. Under surface opaque, but without clothing. Tibiæ setose externally.

Greymouth; No. 65, Helms.

This very remarkable insect I first received from Mr. Reitter, of Vienna, and, supposing it might go into the genus *Syncalus*, proposed to call it *Syncalus Reitteri*. I find, however, it departs much from *Syncalus* by the more approximate middle and hind legs, and I have therefore called it *Acosmetus Reitteri*, as it agrees tolerably well with the characters assigned by Broun to this generic name. Whether it be really congeneric with Broun's two species of the genus is doubtful, as I have seen neither of them.

Nosodendron zealandicum, n. s.

Ovale, convexum, nigerrimum, sat nitidum, antennis tarsisque piceis, vix pubescens, dense punctatum, et in elytrorum parte basali punctis seriatis parum conspicuis. Long. 5—6 mm.

Head rather elongate, densely punctate. Thorax short and broad, very closely applied to the elytra, and continuous in outline with these, very transverse, regularly narrowed from the base to the front. The surface very densely punctate. Punctuation of elytra finer and not so

dense as that of the thorax, so that the surface is distinctly shining, although, when carefully examined, a very fine minute pubescence is found to exist; and, in addition to this diffuse punctuation, there exists some abbreviated series of fine punctures on the basal portion. Under surface rather regularly and distinctly punctate, the head more densely than the other parts, and with a longer and more conspicuous pubescence. Antennæ obscure red, with darker club; the 1st joint concealed under the side of the head; 2nd joint short and stout; 3rd very slender and elongate, as long as the three or four following joints together; 8th excessively short, lenticular; 9th to 11th forming an elongate club, very densely covered with fine sensitive pubescence.

Greymouth; No. 210, Helms.

Species of this genus are widely distributed in both hemispheres. Broun ('Manual,' p. 242) has described a *Nosodendron ovatum*, which is no doubt a very distinct species from that here described, and may even be generically distinct. The New Zealand insect has the tibiæ less remarkably formed than in any of its allies I have seen.

Ceratognathus dispar, n. s.

Parvus, subdepressus, opacus, niger, supra fortiter parum profunde punctatus, squamulis sordidis parce vestitus, antennarum basi rufo-obscuro. Long. 6½—8 mm.

Mas. Mandibulis parum elongatis, spatio aperto magno inclaudentibus, versus apicem triacuminatis; antennarum clava sat elongata.

Fem. Capite angustissimo, exserto; antennarum clava perbrevi.

This is a curious species, and the sexes are very unlike, even as regards colour, sculpture, and clothing.

In the male the head is about half the width of the thorax, its anterior angles very prominent, the mandibles not quite so long as the head, and curved so as only to come into contact with one another at the tips, and so appearing from above to enclose a comparatively large vacant space; the upper surface of the head bears coarse round punctures, and some erect hairs or scales; these are most conspicuous behind the eyes. The maxillary

palpi are elongate. The thorax possesses numerous distinct punctures nearly evenly distributed on its surface, except that they are wanting on a line along the middle, and it has also some pale depressed clay-coloured scales. The elytra are sculptured like the thorax with distinct distant punctures, and bear a few clay-coloured scales, distributed in an irregular manner, and also some dark scales, easily overlooked in consequence of their similarity to the ground colour. The club of the antenna is in this sex nearly as long as the rest of the antenna. The female has the head very narrow, narrower in front than at the neck, the eyes very small, the mandibles short but porrect, the maxillary palpi yellow, shorter and thicker than in the male. The surface of the head is coarsely and closely punctate, and bears rather numerous ashy-coloured setæ or scales. The thorax is also rather coarsely and closely punctate, and bears numerous elongate, narrow, ashy-coloured scales; the sculpture and clothing of the elytra are similar to those of the thorax. In this sex (to judge from a single individual) the colour of the legs and antennæ is paler than in the male.

This curious little Lucanid cannot properly be placed either in *Mitophyllus*, of which it has the legs, or in *Ceratognathus*, with which it agrees in some other points; but as there are, no doubt, other species to be discovered in New Zealand, and as the limits of the genera of *Æsalides* are difficult to determine, it had better remain at present in *Ceratognathus*. *Ceratognathus albo-guttatus*, Bates, still, I believe, unique in collections, is probably an allied species.

Sericospilus, n. g. (*Heteronycides*, Lacord.)

Corpus elongatum, haud pubescens, subtus nitidum. Oculi convexi. Antennæ 8-articulatæ, articulo 3o quasi in medio articuli quarti faciei interni inserto, hoc elongato, sed articulo quinto multo breviore, articulis 5—8 valde elongatis, longius densiusque setulosis, clava elongata tenui formantibus. Ligulæ pars anterior angusta; palpi maxillares elongati. Metasternum elongatum. Unguiculi simplices.

This genus is allied to *Odontria*, but is distinct by a number of characters. The elongate form, the bare

under surface, the elongate metasternum, the narrow ligula, and more elongate maxillary palpi are abundantly sufficient for generic distinction. The form is very similar to that of the Patagonian genera, *Sericoides* and *Listronyx*, and it is probable that, notwithstanding the slight difference in the porrection of the labrum, it is more allied to them than it is to *Odontria*. *Listronyx* has a similarly-formed club of the antenna, except that it is 5- instead of 4-jointed. It is probable that Lacordaire pursued an erroneous course in uniting White's genus *Eusoma* with *Odontria*, but as I am not acquainted with the insect described by White I cannot speak with decision as to this.

Sericospilus advena, n. s.

Suboblongus, parum convexus, fere parallelus, supra opacus, subtus sat nitidus, haud vestitus, corporis margine laterali setuloso, capite anterius ferrugineo, posterius nigricante ; prothorace irregulariter punctato, fusco-ferrugineo, lateribus dilutioribus; elytris ferrugineis nigro quasi marmoratis, plagis his nigris, lateraliter visis, opalescenti-micantibus, pectore pedibusque testaceis ; tarsis elongatis, gracilibus. Long. 13, lat. 6 mm.

The colour and sculpture of the wing-cases is peculiar ; they have a rather indefinite but not coarse punctuation, which is not arranged in series, and they are indistinctly costate longitudinally, the appearance of being ribbed being caused apparently quite as much by the arrangement of the colours as by elevation of the surface ; the colour is obscure yellowish, but there are numerous patches of dark colour arranged in a serial manner ; these patches are of irregular outline, and those in each series tend to be connected with one another ; seen in a certain light the elytra assume in consequence of these patches a brilliant appearance. The sides of the breast are rather closely punctate. I have five individuals before me, but can detect no sexual distinctions.

Greymouth ; No. 126, Helms. New Zealand ; No. 1860, Henry Edwards, Esq.

MESANOBIUM, n. g.

Caput parvum, valde inflexum, oculis minoribus sed convexis. Antennæ 11-articulatæ, quasi simplices, articulis inter se parum dissimilibus, nec serratæ, articulis ultimis nullo modo elongatis. Prothorax parvulus, supra æqualis, lateribus haud marginatis, prosterno brevissimo, coxis fere contiguis. Mesosternum simplex; pedes intermedii sat distantes. Metasternum haud impressum.

Head very short, greatly inflexed; the eyes small, but prominent and nearly circular; the mandibles largely exposed in front of the clypeus (terminal joint of maxillary palpus apparently narrowly oval, with slightly acuminate extremity). Antennæ rather small, 11-jointed, the first joint swollen and glabrous, the others finely setose and pubescent; 2nd joint rather stouter than the following, but not longer than it; 3rd slender; 4th slightly less slender; 5th a little longer than 4th; 6th to 11th differing very little from one another; the 10th and 11th each about as long as broad. Prothorax not produced in the middle in front, but, as the pronotum is greatly longer than the prosternum, having the appearance of being so produced when viewed laterally. Prosternum very reduced in size, but simple, not hollowed; the front coxæ small, and nearly contiguous, but separated by a slender band; the pronotum not limited from the side portions. Middle coxæ moderately distant, the space between them not impressed. Tarsi rather long and slender, but getting slightly broader from the base to the 4th joint.

This minute and unattractive insect is one of the least differentiated of the forms of *Anobiidæ*. It has the appearance, colour, and sculpture of the genera *Dryophilus* and *Priobium*, and may be placed between them if the antennæ be disregarded, but differs from both the genera named by the structure of these organs; no other position can be suggested for the insect, and, as I consider that too great an importance has been attached to the antennæ in comparison with other parts of the structure in the *Anobiadæ*, I think its place should really be that I have mentioned. Broun (Man. N. Zealand Col., p. 687) has described an insect under the name of *Sphinditeles*, which may possibly be allied to this, but as

he does not allude in any way to the sternal structure—the most important of all the characters in this group—it is impossible to come to any decision on the point.

Mesanobium debile, n. s.

Fuscum, supra rufescens, antennis pedibusque rufis, corpore supra opaco, dense subtilissime sculpturato, pube tenuissima depressa vestito. Long. 2—2¼ mm.

Prothorax a good deal narrower than the elytra, above about as long as broad, convex, rather narrowed from the middle towards the front; surface sculptured with very dense, fine, minute, granulations. Elytra very finely granulose, like the thorax, but possessing in addition numerous very minute and obscure small punctures, giving rise, under careful examination, to the appearance of a rudimentary striation. Ventral segments finely, closely, and evenly punctate.

Found by Mr. Helms at Greymouth. I have three individuals before me, but I can detect no certain sexual differences.

Dasytes helmsi, n. s.

Elongatus, angustulus, postice latior, opacus, supra purpureo-niger; subtus niger, violaceo-tinctus; antennis nigris; supra tenuissime pubescens, elytris crebrius parum argute punctatis. Long. 6 mm.

Antennæ extending quite to the hind margin of the thorax, black, a little thickened towards the extremity, the penultimate joint not twice as long as broad. Head rather elongate, about half as broad as the wing-cases, narrowed behind the eyes. Thorax nearly as broad as long, much constricted in front, the basal and lateral margins very distinct, but the latter becomes indistinct at the anterior constriction or impression, the surface very indistinctly punctured and finely pubescent. Elytra closely and rather finely punctate, but the punctuation indistinct, although somewhat rugulose; the pubescence very indistinct. Legs long and slender, nearly black above, deep blue beneath.

Although very different in colour from *D. wakefieldi*, it is in form, and probably in structure, closely allied thereto.

Greymouth; No. 52, Helms.

I have received specimens of this species, all collected by Mr. Helms, from several entomologists, and it is distributed in collections under the name I have given it in recognition of Mr. Helms' services and liberality.

Cyphon variegatus, n. s.

Latus, sat convexus, subrotundatus, nitidus, parcius parum subtiliter pubescens, testaceus, capite thoraceque rufo-testaceis, elytris nigro-signatis, antennis ultra medium fere nigris. Long. $3\frac{1}{2}$ mm.

Antennæ rather short, the four or five basal joints yellow, the others darker, the terminal ones being nearly black; 3rd joint very small and slender; 4th distinctly longer than the following; 5th to 10th differing very little from one another. Head broad, distinctly pubescent, but scarcely punctate. Thorax considerably narrower than the elytra, pubescent, and indistinctly sculptured like the head. Elytra with a distinct punctuation, the punctures moderately close, quite distinct and definite at the base, becoming obsolete towards the apex, and with a rather elongate pubescence, of a yellowish colour, marked with a basal transverse black fascia, a common mark on the middle, which extends backwards along the suture, and unites with an oblique apical mark that encloses a pale space on the outside near the apex of each wing-case. Under side and legs yellow.

The marks on the elytra are often very conspicuous, but sometimes are nearly or quite absent, the basal ones disappearing first.

The species is closely allied in its structure to *C. æqualis*, Sharp.

Greymouth; Nos. 70 and 72, Helms.

Techmessa distans, n. s.

Depressa, nigra, parum nitida, antennarum articulorum basibus pallidis; setulis paucis erectis munita; prothorace fortiter transverso, inæquale, fortiter punctato; elytris dense fortiter punctatis. Long. 5—7 mm.

Antennæ elongate and slender, reaching half-way, or more, of the length of the wing-cases, quite black, but with the extreme base or articular portion of each joint, from the 4th onwards, pale yellow. Head coarsely

punctate; the vertex behind the eyes not elongate. Thorax strongly transverse, narrower than the wing-cases, rounded at the sides, and narrowed behind; on each side is a large impression, posteriorly somewhat indefinite, and more or less distinctly joined, in front of the scutellum, with its fellow; the surface coarsely and rather closely punctate. Elytra densely, deeply, and coarsely punctate, dull. Legs black.

In the male the 2nd and 3rd joints of the antennæ are a little shorter than they are in the female.

The species should evidently be placed with *T. telephoroides*, Bates, in a different section from *T. conclor*.

Greymouth; No. 251, Helms.

Rhinorhynchus, n. g. (*Rhinomacerides.*)

Corpus suboblongum, dense punctatum et pubescens. Caput ante oculos subite et valde constrictum; rostrum tenue, a medio ad apicem paulo latius, deplanatum, oris partibus exsertis. Mandibulæ elongatæ, graciles, falcatæ, extus (et fere certe intus) integres. Antennæ elongatæ, rectæ, subtenues. Elytra sine stria suturali discreta, epipleuris angustis sed sat distinctis, linea externa epipleurali ad basin parum distincta sed post basin bene elevata. Tarsorum unguiculi brevi, ad basin incrassati, itaque in medio dentati apparent.

The very distinct rostrum varies according to the sex, being longer and more slender in the female; it is but little curved; the palpi and mandibles are conspicuously exposed at its extremity. The anterior coxæ are quite contiguous, placed at a distance from the front of the prosternum. The ventral sutures are very deep. The tarsi of normal tetramerous structure.

This insect is an undoubted member of the small group *Rhinomacerides*, and appears, so far as I can judge from the description of the European genus *Nemonyx*, to be closely allied thereto. I have only before me a single pair of this minute creature, and cannot, therefore, at present fully see its characters. It has some resemblance in general form to *Pachyura* of the *Belidæ*, but may be distinguished at a glance by the flattened rostrum and the conspicuously exserted mouth-parts.

It is an interesting addition to the New Zealand forms of *Rhyncophora*. Leconte ('American Naturalist,' July, 1874, p. 391) considers the *Rhinomaceridæ* as a "synthetic form making the nearest approach in the *Rhyncophora* to the lower *Heteromera*, and therefore the representative of old forms clings to an old and synthetic type of vegetation." It will be interesting to discover the habits of the New Zealand representative family, and see whether it supports, as is highly probable, Leconte's theory.

Broun has described (Man. N. Zealand Col.) an insect under the name of *Rhinomacer rufula*, but I cannot say from his description whether or not it is congeneric with *Rhinorhynchus zealandicus*.

Rhinorhynchus zealandicus, n. s.

Minutus, rufescens, elytris plus minusve fusco-rufis, dense fortiter punctatus, conspicue flavo-griseo pubescens, opacus, antennis pedibusque testaceis. Long. (cum rostro porrecto) $2\frac{3}{4}$ mm.

Mas, rostro breviore, prothoracis vix longitudine, basi punctato, antennæ ultra medium insertæ.

Fem., rostro prothorace paulo longiore, tenuiore, glabro, polito, antennæ fere in medium insertæ.

Antennæ reddish yellow, extending quite as far back as the base of the thorax, not in the least geniculate; the 1st joint rather longer than the 2nd, but scarcely stouter than it; joints 3—8 rather slender; 9—11 forming an elongate, very laxly-jointed club, the joints of which differ but little in length *inter se*. Thorax much narrower than the after body, rather longer than broad, the sides very gently and evenly rounded. The surface densely, evenly, and coarsely punctured, and with a dense, rather elongate, depressed pubescence. Elytra densely, deeply, and coarsely punctate, with a dense, rather coarse, pubescence, which much conceals the sculpture. Legs yellow, rather short and stout; the tibiæ straight, without spurs or hooks.

Found by Mr. Helms at Greymouth in the spring of 1881.

Anagotus, n. g. (*Curculionides, Cylindrorhinidæ*).

Rostrum sat elongatum, ad apicem dilatatum, supra antennarum insertionem angulatim prominulo; scrobes obliquæ, profundæ, longe ante oculos desinentes; corpus tuberculatum, prothorax gracilis; pedes elongati, tibiæ simplices, haud mucronatæ, apicibus nullo modo dilatatis.

This is a remarkable insect, having rather the facies of an African ground weevil than of any New Zealand form hitherto discovered, and perhaps the type of a distinct group near the *Hipporhinides*. The scrobes are continued to the apex of the rostrum, and there, owing to the dilatation of the latter, exposed in front; they are continued obliquely backwards, passing to the under surface, but become obsolete about half-way to the eye. The basal joint of the antennæ reaches to the eye, and is nearly as long as the other joints together; the club is well marked, though slender and elongate. The mandibles are without scar, and are not very different from those of *Lyperobius*. The front coxæ are contiguous. The metasternum is short; the 1st ventral segment is in the middle a good deal longer than the 2nd, which is quite twice as long as the 3rd. Legs elongate and slender; tibiæ quite unarmed, not thickened at the apex. Tarsi slender, the 3rd joint scarcely broader than the preceding ones, its apical lobes quite short; it, as well as the two basal joints, rather densely pubescent beneath, with a glabrous space along the middle.

At present this insect may be placed near *Inophlæus*, at the head of the *Cylindrorhinidæ*, till its peculiarities can be more correctly appreciated; it appears to me to have considerable affinities both with the *Amycterides* and *Hipporhinides*, though differing greatly from the former by the elongate rostrum.

Anagotus helmsi, n. s.

Niger, indumento sordide fusco vestitus, femoribus versus apicem late albido-cingulatis; prothorace elytrisque tuberculatis. Long. (cum rostro) 18 mm.

Thorax slender, longer than broad, approximating to cylindric, but the upper surface very irregular, with an

elongate elevation in the middle in front; a rather large prominence on each side of this, and other smaller less conspicuous asperate tubercles. After body very convex, very narrow at the base, with a longitudinal series of large tubercles near the suture, and a row of smaller tubercles outside this and marking the part where the sides become perpendicular (these slope even a little inwards), and with other smaller asperities, and with longitudinal series of large punctures or pits, which are indistinct in the spots where the tubercles are much developed. Legs elongate and slender.

This remarkable species has been discovered at Greymouth by Mr. Helms, and a specimen sent to me as No. 133.

Pentarthrum helmsianum, n. s.

♂. Robustum, sat elongatum, nigrum sat nitidum, prothorace crebre fortiter punctato; elytris sat fortiter striato-punctatis; rostro lato, anterius latissime angulariter dilatato, subrhomboidali. Long. 6 mm.

Antennæ black, with the intermediate joints piceous; the basal joint opaque and somewhat twisted, so as to appear emarginate in one aspect. Rostrum very broad, extremely dilated in front, so that the sides project as acute angles, and the front margin is curved; the upper part is rather closely, the anterior more sparingly, punctate; the neck is smooth, and the eyes are not very far from the front of the thorax. This latter part is rather broad, and a good deal rounded at the sides, the surface rather coarsely, moderately closely, evenly punctate and shining. Elytra with impressed striæ, which are distinctly punctate; the interstices scarcely punctate, but somewhat dull and obscurely rugulose. Legs black, robust, all the tibiæ armed at the apex internally with an angular process, which is on the hind legs large and remarkable. The female is unknown.

This peculiar insect will probably ultimately form the type of a genus distinct from *Pentarthrum*, but as it goes very well into that genus, as at present defined, it is not necessary to make a new name for it. The great development of the rostrum reminds one rather of some of the *Brenthidæ* than of a Cossonid. The two individuals before me are quite similar, and I have no

doubt I am correct in considering them to be of the male sex.

Greymouth; No. 227, Helms.

Didymocantha robusta, n. s.

Fuscula, capite thoraceque rufis, antennis pedibusque rufo-testaceis; elytris nitidis, fortiter punctatis, pubescentia sparsa erecta vestitis, ex parte majore testaceis, argute-fusco signatis. Long. 12½ mm.

Head red, coarsely punctate and much pubescent. Antennæ pale red, their basal portion much pubescent; towards the apex the pubescence becomes gradually less, and is wanting on the apical joint. Thorax red, about as long as broad, the surface very uneven, with a smooth longitudinal space on the middle, on each side of which are coarse punctures; this smooth space does not extend to the front part, which is coarsely punctate; on each side of the middle towards the front there is a very distinct shining tubercle, and externally to this a less distinct sublateral tubercle; the angle at the side behind the middle is very prominent; the surface bears much pale pubescence. Elytra shining, definitely and coarsely punctate, and from each puncture there rises a pallid suberect hair; the punctuation is distant and regular; along the side of the wing-case, from the shoulder to the apex, extends a dark mark, and across the surface stretch two transverse irregular fasciæ of dark colour, the anterior one is angulate, and, as it proceeds from the side to the suture extends forwards, and along the suture extends to the scutellum; the posterior transverse fascia is broad and angulate, and sends a narrow prolongation backwards along the suture to the apex. The femora are red, and stout for this genus; the tibiæ and tarsi yellow; under surface fuscous-red, with very scanty fine white pubescence. The individual before me is of uncertain sex.

The shorter and stouter femora distinguish this insect strongly from *D. sublineata*; probably it is allied to *D. picta*, Bates, a species I have not seen.

Greymouth; No. 130, Helms.

Somatidia helmsi, n. s.

Parum convexa, elytris dilatatis, ad apicem attenuatis; thorace parvo, ferrugineo, ad latera nigricante, utrinque tuberculo parvo; elytris nigro-fuscis, ad basin plaga maxima communi pallide ochracea. Long. 4½ mm.

This curious insect, with very sharply defined coloration, has the body but little clothed with down, the variegation being caused by tinting of the chitinous substance. The thorax is reddish, with the sides darker, the lateral portions coarsely and closely punctured, the middle less distinctly; at each side behind the middle is a small but prominent tubercle, and on the disc, just in front of the middle, are two obscure elevations. Elytra narrowed at the base and apex, the greatest width in front of the middle, of a blackish colour, but with a very large and extremely sharply defined pale basal portion. The surface bears numerous coarse but not deep punctures; on the middle of the pale colour there are four obscure elevations, and on the line of junction of the two colours are four other elevations, two on each side like the anterior set, the external being more indistinct than the internal; the dark posterior portion bears also two small elevations, one in front of the other, on each wing-case. The femora are rather pale at the base, dark at the extremity; the tibiæ are dark at the base, then show a broad pale ring, and their extremity is also pale, as are likewise the tarsi.

Greymouth, found by Mr. Helms.

I have much pleasure in naming this interesting little insect after its discoverer.

Xylotoles huttoni, n. s.

Parum elongatus, posterius attenuatus, corpore toto cum antennis pedibusque dense tomentoso; pedibus parum elongatis, dense vestitis, femoribus basi superne nudo rufescente; antennis variegatis. Long. 7 mm.

Head very short; antennal tubercles, placed quite on its upper part, prominent; granulation of eyes very coarse. Thorax with a transverse depression behind the front, and another at an equal distance before the base; from the middle of the anterior depression there extends a depression backwards, on each side of which the

surface is rather more elevated, and is densely tomentose with pale grey pubescence, the rest of the surface being covered with darker, but mottled, pubescence; at each side about the middle there is a prominent speck of pure white pubescence. Elytra not prolonged, but broadly dehiscent at apex, densely clothed with dark tomentum, which is, however, speckled and mottled, and bears some small but prominent tufts. Legs and tarsi very densely clothed. Antennæ mottled with greyish spots; the base of each of joints 4—11 yellowish. Under surface densely clothed everywhere with fine pubescence.

This aberrant *Xylotoles* tends to connect *Xylotoles* and *Tetrorea*; although very different, owing to its clothing, from the other species, I do not see any characters that necessitate at present its generic isolation, unless the coarser granulation of the eyes and shorter head be considered such.

I received a single individual from Prof. Hutton, after whom I have named it, some years ago (1877). It was found by him in Otago.

Hybolasius deplanatus, n. s.

Parvus, oblongus, subdepressus, fuscus, superne rufescens, antennis pedibusque rufis; prothorace dense subtiliterque granuloso punctato, vittis tribus flavescentibus parum argutis pubescentiæ ornatis, ad latera angulatis; elytris parum inæqualibus. Long. 3—4 mm.

Antennæ red, slender, sparingly hispid. Head infuscate-red. Thorax very transverse, strongly angularly prominent at each side, the surface densely covered with minute asperities, which are more than usually visible on account of the scanty pubescence; this latter is yellowish in colour, and arranged so as to form three indistinct longitudinal bands. Elytra reddish, more or less distinctly marked with fuscous along the suture; this colour beyond the middle rather abruptly turned towards the sides, and bounded about the middle by a very obscure longitudinal elevation; the surface rather sparingly pubescent, and irregularly punctate, but almost destitute of erect setæ. Legs clear red.

This species is allied to *H. bellicosus*, Broun, but is more brightly coloured, and of more slender build, with the antennæ and upper surface less hispid, &c.

Greymouth; Helms.

Tetrorea sellata, n. s.

Sat elongata fere gracilis, nigricans, pube variegata vestita, elytris ante medium plaga pallidiore oblique descendente, pedibus articulisque 1—4 antennarum maculatis, harum articulis 5—10 nigro-fuscis, singulo ad basin late pallido-annulato ; elytris utrinque pone scutellum tuberculo parum elevato, singulo ad apicem rotundato ; antennis pedibusque fere gracilibus. Long. 11—12 mm.

Eyes comparatively little separated on the vertex. Thorax with large lateral prominence, and with broad tubercle on each side of the middle. Scutellum clothed with black pile. Each wing-case has an obscure elevation near the base, and numerous large punctures about the scutellum ; the lateral portions are also a good deal punctate ; the surface is variegate with obscurely-coloured down, and there is a patch of pale colour descending obliquely from behind the shoulder, and meeting its fellow of the opposite side just in front of the middle. The legs are rather slender, and bear only a few erect white setæ.

Greymouth ; Helms.

This departs from the typical species by the form of the apices of the elytra, and by the eyes being less separated on the vertex, but it cannot with advantage be separated at present as a distinct genus, especially as it bears a great general resemblance to *T. discedens*. The colour of the down on the scutellum, independently of more important characters, permits it to be distinguished at a glance from *T. discedens*.

Tetrorea discedens, n. s.

Pube variegata, ex parte majore fusco-olivacea, vestita, elytris pone basin plaga magna communi pallidiore, antennis pedibusque conspicue maculatis, abdomine utrinque flavo-maculato ; prothorace in medio plaga nuda, nitida ; elytris utrinque pone scutellum tuberculo elevato, etiam ad medium et ante apicem penicilla parva instructis. Long. 11—13 mm.

Antennæ reaching slightly beyond the extremity of the body, very distinctly maculate, the basal joints more or less ferruginous. Thorax with an angular prominence

on each side, with a small shining space on the middle of the disc, and in front of this, on each side, a not very distinct tubercle. Scutellum clothed with ochreous scales along the margin. Elytra not prolonged at the apex, but distinctly dehiscent there, the apex of each not rounded, but rather obscurely and a little obliquely truncate. Tibiæ sparingly clothed with fine setæ.

One individual, which I believe to be a male, is larger and more robustly formed, and has the legs thicker, and the tibiæ more setose. The colour is variable, the large common patch on the elytra being sometimes white, in other cases only a little paler than the general colour.

Otago; Prof. Hutton. Greymouth; Helms.

MESOLAMIA, n. g.

Corpus sat robustum, subtile tomentosum. Caput facie perpendiculari brevissima. Oculi mediocriter granulati. Antennæ (feminæ ?) corpore breviores, sat robustæ, articulo basali parum elongato, et parum dilatato, quam tertio paulo breviore. Thorax ad latera angulatus. Elytra apicibus rotundatis. Pedes breves, femora breviora crassa. Cetera fere ut in *Tetrorea*.

The insect for which I have established this genus has given me some trouble on account of its want of special resemblance to any other of the New Zealand Lamiades, while at the same time it possesses no striking peculiarities of its own. It is perhaps nearest to *Tetrorea*, from which it differs by the more finely facetted eyes, as well as by the different form and the peculiar head. This last character renders the genus of special interest, for the shape of the head only exhibits the *Lamia* characteristics in a comparatively imperfect manner. The perpendicular part of the head is quite short, and is not abruptly differentiated from the vertex, the middle portion in fact passing quite gradually into the plane of the vertex; both the vertex and front are canaliculate along the middle, and a fine transverse suture can be detected in front of the eyes. The anterior coxal cavities have externally a small transverse fissure. The external structure of the middle cavities is not easily ascertained without dissection, the surface there being uneven in consequence of the large size of the globose coxæ; but it appears to me the side

wing of the mesosternum does not quite meet the metasternum. As the general structure of the under surface is not very different from that of *Tetrorea*, it may be placed next to that form.

Mesolamia marmorata, n. s.

Fusco-rufa, pube flavescenti subtili dense vestita, maculis fusco-rufis adspersa; elytris parum inæqualibus, singulo ad apicem rotundato. Long. 9—12 mm.

The surface is apparently of a dark or obscure red colour, closely covered with a fine, closely adpressed, yellow pile, but in parts this pile is replaced by a pile of a darker colour, thus giving rise to a maculated appearance, most of the spots being of small size and round in shape. The antennæ are rather stout, and are not hispid; each joint bears rather scanty pale pile on the basal portion, and this therefore appears paler than the apical part of each joint. The vertex is deeply channelled, and between the antennæ there is a rather deep depression, which is continued on the front of the head as a fine channel. The thorax is narrower than the elytra, and is not so long as broad; on each side it is much dilated to form a large angular prominence; the surface is not at all tuberculate, only a little uneven, and bears numerous small spots of the kind already described. The surface of each elytron is elevated near the base on each side of the scutellum, and there is also on the middle of each an obscure longitudinal folding or elevation; there is a large, irregular, curved, dark mark on each, as well as numerous small spots. The rather stout, short, legs are destitute of setæ, but are clothed with fine pile; the femora are a little maculate, and there is a dark mark on each tibia below the middle.

The female has the apical ventral segment very largely impressed, and at each side bears elongate pubescence, which projects towards the middle, and so much conceals the depression. The male is unknown.

Two specimens of this species were sent from Dunedin by Prof. Hutton in 1877.

Chalcolampra speculifera, n. s.

Oblongo-ovalis, sat convexa, testacea, elytris plagis magnis nitidissimis fusco-æneis, antennarum basi fuscescente, pedibus geniculis nigris. Long. 8, lat. 4 mm.

Antennæ slender and elongate, reaching half-way to the extremity of the wing-cases. Prothorax transverse, distinctly narrower than the elytra, the sides nearly straight, very finely and evenly margined, the base unmargined, the front rather broadly margined, the surface rather finely and irregularly punctate. Scutellum shining and impunctate. Elytra yellow, but each with three large and extremely highly polished spaces of a dusky brassy colour; one of these is situated near the scutellum, and is but little separated from its fellow of the other side; it is extended backwards along the suture, but is here less well defined and conspicuous, till it joins the apical patch; this latter is very brilliant, and sends off externally towards the front a small prolongation, which nearly or quite unites with the third or lateral mirror; this is placed near but does not touch the side, and in front is prolonged as far as the shoulder; there is also a minute dark spot on the shoulder; the yellow portion of the wing-cases is rather coarsely and irregularly punctate; the apices are a little produced, and very distinctly truncate. The legs are yellow, with the knees broadly marked with black.

This remarkable insect is one of the most interesting of Mr. Helms' Greymouth captures, as it introduces us to a new feature in the New Zealand Coleoptera, and one which I had hitherto supposed to be quite wanting, *viz.*, the existence of true *Chrysomelidæ* of Chapuis' division *Cycliques*. The genus *Chalcolampra* is well represented in Australia, and has some species in Austro-Malasia.

Allocharis, n. g. (*? Phyllocharites*, Chap.)

Elytra libera. Metasternum sat breve, quam pronoto breviore. Acetabula antica occlusa. Palpi maxillares breves, haud incrassati, articulo ultimo quam precedente angustiore et paulo breviore, apice obtuse acuminato. Antennæ parum graciles sat elongatæ. Pedes omnes distantes, posteriores valde distantes. Mesosternum inter pro- et metasterna distinctum. Tibiæ haud

canaliculatæ; tarsorum articulo 3o ad apicem sat profunde emarginato. Facies inter *Chrysomelam* et *Prasocurem* quasi intermedia.

This is an anomalous insect, but on the whole is probably most allied to the *Phyllocharites* of Chapuis. The metasternum is not so abbreviate as in *Cyrtonus*, its length being just intermediate between those of *Cyrtonus* and *Gonioctena*. The metasternum is brought up to the level of the middle of the pro- and metasterna, and exposed between them as a curved linear piece. The claws of the tarsi are short, and armed at the base with an angular dilatation. The maxillary palpi do not differ much from those of *Cyrtonus*. The elytra are not soldered, but I am unable to say whether wings are present or not.

Allocharis marginata, n. s.

Oblongo-ovalis, sat elongata, convexa, nitida, fusco-ænea, elytris rufo-marginatis, antennis palpis pedibusque testaceis; elytris subtiliter seriatim punctatis, interstitiis fere impunctatis. Long. $5\frac{1}{2}$, lat. $2\frac{7}{8}$ mm.

Antennæ clear red, stout, rather longer than head and thorax; 2nd joint quite as broad as 3rd, and distinctly shorter than it; 6th a little shorter than the contiguous joints, and rather longer than broad. Head much immersed in thorax, its surface distinctly but irregularly punctate; eyes small, coarsely granulate. Thorax rather strongly transverse, but little emarginate in front, a little narrower than the elytra, the colour shining brassy, becoming rufescent or fuscescent towards the sides, the surface rather finely and distantly punctate; the lateral and basal margins are fine but distinct throughout; the front margin is even finer than the others, and is obsolete in the middle. Scutellum not large, rather broad, curvilinearly triangular, impunctate. Elytra of an obscure brassy colour, with the sides broadly and distinctly rufescent, and the base more obscurely so, not at all striate, but bearing each nine series of fine punctures, and with some other very fine and distant punctures. Legs rather short and stout, reddish yellow.

I received a single specimen of this rather obscure looking but interesting insect from C. M. Wakefield, Esq. It is labelled "Craigie burn, Powell."

VI. *Additional notes on* Bombyces *collected in Chili by* Mr. Edmonds. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Read March 1st, 1882.]

It will be noticed that in my account of the Bombyces collected in Chili by Mr. Edmonds, reference has been made to descriptions of several larvæ sent to me, but which I could not find among the notes in my hands (*antea*, pp. 18 and 20).

In looking over supplementary notes upon the butterflies received from Mr. Edmonds, I was surprised to find these descriptions; they are written (in pencil for the most part) upon letter paper, and had been placed with various letters received and answered, which must be my excuse for overlooking them, though it is, I admit, but a lame one at best.

As fresh material has been received from Chili since the reading of my paper, and has come into my hands within the last few days, I think the best thing to do is to describe the new forms, giving at the same time the notes on species already enumerated; I much regret that such a course should be necessary, but it seems decidedly preferable to omitting valuable information which must prove useful to future collectors.

22. *Ormiscodes crinita*, Blanch.

"*Larva*.—Black, with interrupted transverse bands of yellow, and clothed with long brown bushy prickles and short grey hairs; head shining black, thinly clothed with short grey hairs; body velvety black, variegated with orange, brown, and yellow; the yellow markings forming transverse bands, irregularly spotted with black on the front part of each segment except the second; immediately behind the yellow band on each segment there are six bushy spines, two on the back and two on each side, of a dark brown colour, except the extreme points, which are grey and very sharp. The spines on

the second segment are directed forwards, and those on the anal segment backwards; the back part of each segment is ornamented with small orange-brown spots, and three patches of short grey hairs, one patch on the back and one on each side; prolegs and claspers dark reddish brown, thinly clothed with short grey hairs; under side dull black. The spines sting severely when touched. Feeds in July, August, and September on 'Quilo' (*Muhlenbeckia sagittæfolia*), and also on poplar, pepper, rose, and a number of other trees and shrubs.

"*Pupa*.—Dull black, and enclosed in a loose cocoon, sometimes placed among dead leaves or rubbish on the surface of the earth. The perfect insect appears in January and February."—*T. E.*

The following description must, I think, refer to—

26. *Cinommata bistrigata*, Butl.

"Larva of ? *Hyperchiria* sp.*—Length 1¼ inches; thinly clothed with fine hairs; head yellowish white, with a narrow black streak running from the back across the face, forked at the end nearest the mouth, and a black streak on each side of the face; body dull grey, with a double dorsal line and broad subdorsal line dirty yellowish white; the former lines interrupted on the third and fourth segments by large black patches, and the subdorsal lines of a dull orange colour on the hind segments; a broad spiracular line white, with a fine horizontal crimson dash on each segment, and bounded above and below by a narrow black line; each segment furnished with six tufts of sharp-pointed bristles, colour very pale brown, with the extreme tips black, length rather less than a line; two subdorsal, two lateral, and two below the spiracles; a small smooth spine about 1-16th of an inch long, soft, and of a bright red colour, springs from the white spiracular line on each side of the fifth segment; spiracles white, edged with light brown; under side dirty yellowish white, often tinged with green; legs and claspers very pale brown. Feeds on 'Coligne' (*Chusquea cummingii*); full-fed beginning to middle of December; obtained when young by beating."—*T. E.*

* The number is omitted, and therefore for the present the identification must remain doubtful.

27. *Cercophora frauenfeldi*, Feld.

"*Larva.*—Head whitish green, with a few very fine short black hairs; second segment pale green, slightly larger than the head, with a few very fine black hairs springing from the front edge and directed forwards; one of these hairs on each side is slightly longer than the rest, and thickened at the tip; the third segment is larger than the second, and has an oval pinkish white spot margined with a fine black line on the back; the fourth segment is much larger than the third, and forms a high peak on the back; this peak is green, thickly dusted with yellow, and directed forwards; immediately in front of the peak there is a spot similar to that on the third segment, but smaller; both the third and fourth segments have some extremely fine silky hairs on each side, and one on each side of each segment is thickened at the tip; from the tip of the peak on each side a raised yellow line runs along the body above the spiracles, ending in a sharp yellow tail-like point at the extremity of the twelfth segment; the rest of the body is pale green, dusted with yellow, inclining to whitish green on the back; the fifth and sixth segments have pinkish spots on the back, and on each segment there is a small black spot, above and adjoining the lateral line, from which a long fine black hair, thickened at the tip, is emitted; prolegs and claspers pale green, and thinly clothed with very short downy hairs of a pale green colour; the body slopes gradually from the peak on the fourth segment, and terminates in a sharp point. This larva is very sluggish in its habits, and clings tightly to the food-plant; when at rest the head is almost hidden by the second segment, and the second and third segments are contracted and held downwards nearly at right angles to the peak on the fourth segment."—*T. E.*

I have introduced this description as being far more minute than my own, which was necessarily taken from the drawing. (See Pl. I., fig. 5).

29. *Eudelia venusta*, Walk.

"*Larva.*—Similar to that of *C. frauenfeldi*, but differs in its larger size, in having the raised line, which runs from the peak on the fourth segment, pale blue on the

top and white beneath, or in front, on that segment, instead of being entirely yellow, as in *C. frauenfeldi*; in having the said line interrupted or replaced on the sides of fifth segment by short treble lines, the top one blue, the middle one black, and the under one orange, and in having the rest of the lateral line pale yellow on top and rose-colour under; in wanting the reddish spots on the backs of the third, fourth, fifth, and sixth segments, and in having a dorsal line of a paler green than the rest of body. Feeds on 'Maiten' (*Maitenus chilensis*).

"*Cocoon.*—Differs from *C. frauenfeldi* in being slightly pear-shaped instead of oval, and is grey instead of yellowish; the larva spun up on August 15th."—*T. E.*

31A. *Polythysana albescens.*

"*Larva.*—Length rather over three inches; head smaller than second segment, greenish, with black markings; colour beneath pale green; above ashy, with a pinkish tinge; a large velvety-black patch on the back of second and third segments, visible only when the larva is walking; body covered with short isolated stiffish hairs; the second, third, and fourth segments have in addition eight bipectinate spines, two on each side, and four on the back of each segment, those on the second segment about three lines long, those on the third and fourth about one line long, and also directed forwards; the primary spines are reddish or pink, the pectinations are generally thick at the base, black and yellow, then they terminate abruptly in a slender whitish hair; the sixth to eleventh segments inclusive are furnished each with four stellate bunches of spines, each of from ten to fourteen prickles, yellow at base, black at tip; the central prickles having more black on them than the peripheral ones; these stellate prickles are situated at equal distances from each other in a line between the two spiracles of each segment; the twelfth and thirteenth segments have but three bunches each; beneath each spiracle the fifth, sixth, eleventh, and twelfth each have two long bipectinate spines, like those on the thoracic segments; the other segments have one each in the same place (when the larva is at rest these are closely applied to the leaf or twig on which it rests); spiracles small, whitish yellow, with a slender black

edge. Full-fed about the end of October or beginning of November.

"*Pupa*.—Enclosed in a pear-shaped cocoon of buff-coloured silk, open at one end (*Saturnia*-like), spun among the leaves of the food-plant."—*T. E.*

A pen-and-ink sketch by Mr. Edmonds represents the bipectinated spines as deflexed on each side of the body like the hairs on some other larvæ.

35. *Hyperchiria erythrops*, Blanch.

"*Larva*.—Dull brown, clothed with prickly spines: head dark brown and shiny; body dull greyish brown, with indistinct subdorsal and lateral lines of dirty white colour, and irregular pale dull orange lines immediately above and below the spiracles; the latter pale dull orange, edged with black; under side and claspers greenish grey; prolegs brown; each segment armed with six tufts of sharp prickles of a light brown colour, the extreme tips dark brown; these sting severely when touched; two tufts are subdorsal, two lateral, and two spiracular. Food-plant, "Maiten," *Bromelia*, bramble, &c. Gregarious when young; a night-feeder; hides by day among dead leaves and rubbish near roots of food-plants; the young brood disperses as it grows older. Full-fed beginning of December."—*T. E.*

The two following new species are referable to the *Notodontidæ*; the larvæ were left in Chili to be reared, and the moths forwarded quite recently to Mr. Edmonds.

Pseudocerura, n. g.

Allied to *Heterocampa*, but with the general aspect of *Cerura*; thorax very flat above, very coarsely scaled; collar very deep; basal hairy clothing of the abdomen represented by an appressed expanded tuft on each side; the abdomen itself rather short, tapering rather suddenly, almost to the extremity, strongly carinated along the dorsal line; anal tuft also carinated, slightly expanded; antennæ rather thick, with very short ciliæ along the anterior surface; legs rather long, thick, and coarsely scaled; primaries with nearly straight costal margin, with convex subangulated outer margin and slightly sinuous inner margin; secondaries subpyriform.

Pseudocerura thoracica, n. s.

Primaries above dark granite-grey, crossed by two widely-separated blackish-edged pale lines, undulated, reversed, and divergent towards the costa, enclosing the ordinary spots, which are as follows: "orbicular" rounded, pale buff, with a black central dot and black margin; "reniform" subquadrate, slightly constricted in the centre, buff, with black margin; a diffused buff crescent, with black lower edge below the "orbicular" spot; base, costal border, and external area buff, spotted with grey and dotted with black; a dentated blackish submarginal line, followed by an almost marginal series of well-defined small spots; secondaries sericeous-white, greyish on abdominal area; a grey spot at end of cell, and a marginal series of black lunules: thorax clothed with green-tipped white scales, giving it a pale green colour; abdomen greyish brown, with whitish anal tuft; under surface sericeous-white; wings with intense black marginal spots; primaries irrorated with blackish scales, and with a black subapical diffused patch; costal border alternately ferruginous and white; a blackish spot with an oblique blackish dash above it at the end of the cell; fringe spotted with blackish; secondaries with blackish basi-costal area; a spot in the cell and a second at the end of the cell black; an arched discal series of short slender grey lunules; front of pectus blackish; venter slightly greyish; expanse of wings, 41 mm.

"*Larva* found September 21st, on 'Boldu'; entirely pale yellowish green, almost transparent, and covered sparsely with minute yellow dots; head shiny; dorsal, subdorsal, and spiracular lines pale yellow; a pointed hump on the twelfth segment; a yellow oblique line extending from the point to near the spiracular line on each side; sixteen legs. When alarmed it throws back its head until it touches the centre of its back."—*T. E.*

Edmondsia, n. g.

Allied to *Lophopteryx*, but with broad *Noctuiform* wings, with deeply undulated outer margins similar to those of *Calicula* and *Sypna* of the Old World; the inner margin of the primaries with a subbasal lobe of long projecting scales; body very robust, coarsely scaled; antennæ rather short, thick (especially in the male), flattened, with the anterior surface slightly but scarcely perceptibly setose.

Edmondsia sypnoides, n. s.

Primaries above smoky brown, with the costal border, discoidal cell, and veins broadly sericeous greyish black; two zigzag velvet-black parallel lines across the basal third, and two more acutely zigzag across the disc; "reniform" spot indicated by a small patch of pale brown scales in the female, but wanting in the male: a submarginal series of black-bordered pale-brown lunate spots, most distinct in the female; fringe blackish, traversed by two paler undulated lines; secondaries smoky brown, with the basal two-fifths sordid-white; fringe as in primaries; a marginal series of pale-edged black lunules most distinct in the female; the latter sex also shows three divergent abbreviated black lines running from the external half of the abdominal margin to about the centre of the disc; thorax dull velvet-black; abdomen pale brown at the sides, blackish in the middle; wings below sericeous smoky brown, crossed beyond the middle by two arched ill-defined darker stripes; outer margin slightly paler; fringe grey, with a blue-black external edge; primaries with white internal border; secondaries pale towards the base, and with a small black spot at the end of the cell; body below dull black; tarsi banded with white. Expanse of wings—male 47 mm., female 58 mm.

Larva of *Edmondsia sypnoides*, Butl.

Larva.—Velvet-black, minutely speckled with white; head rather small and shiny; second segment also small; third segment very full and large, with two large quadrate yellowish spots in front, and with two long black divergent tapering subdorsal horns, filiform at their extremities; the fourth to sixth segments, which are also very full, with a yellowish dorsal patch; the second

to fifth segments with yellow instead of white speckling at the sides; a broad lateral undulated creamy white band from the fifth to the twelfth segment, upon which are the spiracles, which are small and black; the twelfth segment with two slightly divergent tapering thorn-like subdorsal horns; legs, claspers, and under surface slightly greyish.

I have taken this description from a coloured drawing of the larva; as, after looking over all the notes in my possession, I have failed to recognise any description applicable to the species.

VII. *On the terminal ventral segments of the abdomen in* Prosopis, *and other* Anthophila. By Edward Saunders, F.L.S.

[Read March 1st, 1882.]

Plate VI.

Many authors have described and figured the genital armature of the males in *Bombus* and other genera of Aculeate Hymenoptera, but I cannot find that much attention has been paid to the hidden ventral valves of the two segments that immediately precede it, *i. e.*, of the 7th and 8th; indeed, very few authors have mentioned the 8th segment in the imago at all, although this segment is very clearly present in all the species I have examined, and in many its ventral valve affords excellent specific characters.

Leon Dufour ('Recherches Anatomiques.' &c.) certainly noticed the ventral valve of this segment in the genera *Apathus*, *Bombus*, &c., but he considered it as a part of the genital armature, calling it the "hypotome," and saying that it is inserted or perhaps articulated to a common plate, fixed at the base of the armature below.

I think there is no doubt that he was wrong in thinking that this plate is in any way united with the armature, for I have specimens which clearly show its connection with a membrane, which unites it to a membranous or sometimes corneous plate, which projects beyond the apex of the 7th dorsal segment, when the abdomen is much extended, and which, I think, is evidently its dorsal valve.

In extracting the genitalia from dried specimens, the membrane uniting the ventral and dorsal plates of the 8th segment, and often also of the 7th, generally gets torn away, and the ventral plates come away with the armature, so that they have quite the appearance of being part of the actual armature itself. They are, however, easily detached, and the shining smooth under surface of the armature shows no sign of having had any attachment.

It is, I think, quite clear that the abdomen of an aculeate hymenopterous insect should consist of nine segments. Packard, in the 'Proceedings of the Boston Society of Natural History.' vol. x., points out that of the fourteen segments of the larva (counting the head as one), the first represents the head in the perfect insect, the next four the thorax (*i.e.*, including the 5th larval segment, which he shows is taken up into the metathorax during the larval changes), and the remaining nine the abdomen; Packard also points out that the male genitalia are visible in the larva as three pairs of tubercles on the sternal portion of the 9th ring, which 9th ring no doubt represents what we call the genital armature in the imago. Eight segments now remain to be accounted for, and all these, I find, present in such bees as I have examined.

The form of the 8th ventral plate in the male varies very greatly, and appears to afford excellent characters in some genera for sectional purposes. It is this 8th ventral plate which projects somewhat in the form of a spoon at the apex of the abdomen in *Andrena*, and which has been considered as the 7th by many authors; the 7th, however, in this genus lies under the 6th, and is rarely, if ever, visible; the same form of the segment occurs in *Panurgus*, *Cilissa*, *Dasypoda*, and *Macropis*. In *Panurgus* all the ventral segments are visible, as the apex of the 6th is largely and widely emarginate, allowing the 7th to be seen through the emargination. In *Megachile*, where only four ventral segments are visible, the 8th is a mere tongue-like plate lying close to the under side of the genital armature. In our other British genera the 8th is almost always hidden, but in *Prosopis* it is hidden in nearly all the species, and very conspicuously exhibited in one (*hyalinata*). On the Continent there are two or three others which belong to the same section as *hyalinata*, but the section is a very small one compared to the great number of species known.

In *Prosopis* the forms of the 7th and 8th ventral plates are most curious and interesting in all the species, and I have figured these segments of each to show how characteristic they are. As will be seen, they are perfectly distinct in shape, and differ to such an extent in some cases as to make one doubt whether all the species really belong to one genus. The great similarity, however, of the general structural characters throughout the species makes me

hesitate to divide such a well-known and easily recognised genus, especially as I have failed to find any corresponding characters in the female.

I have not here touched upon the peculiarities exhibited in the final segment or genital armature, although they are equally distinct and characteristic in each, for I hope to describe and figure them shortly in the second part of my 'Synopsis of the British Hymenoptera.'

I have also so far sought in vain for any corresponding features in the terminal segments of the female, but I have only dried specimens to work from, and hope, with freshly-killed examples, to be able to pursue my investigations more satisfactorily.

Explanation of Plate VI.

1. *P. cornuta*, Sm.	A, 8th ventral plate.	B, do., lateral view.	C, 7th ventral plate.
2. *P. dilatata*, Kirb.	do.	do.	do.
3. *P. communis*, Nyl.	do.	do.	do.
4. *P. hyalinata*, Sm.	do.	do.	do.
5. *P. confusa*, Nyl.	do.	do.	do.
6. *P. signata*, Panz.	do.	do.	do.
7. *P. punctulatissima*, Sm.	do.	...	do.
8. *P. pictipes*, Nyl,	do.	do.	do.
9. *P. brevicornis*, Nyl.	do.	do.	do.

Note.—Since reading the above, Mr. Fitch has called my attention to two interesting papers bearing on this subject, one by Dr. H. Reinhard (Berl. Ent. Zeit. 1865, p. 187), and the other by Dr. H. Schaum (Ann. Mag. Nat. Hist., March, 1863). The latter author, however, only finds thirteen segments in the larvæ of Hymenoptera, including the head, and on this ground, admitting as he does the transfer of the 5th abdominal segment to the metathorax, there is difficulty in accounting for the eight abdominal segments exclusive of the genitalia, which are present in the imago.

VIII. Heterocerous Lepidoptera *collected in Chili by* Thomas Edmonds, Esq. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Read April 5th, 1882.]

Part II.—NOCTUITES.

Mr. Edmonds obtained forty-five species of Noctuites, many of them being represented by fairly long series, so that it is possible to judge with some measure of certainty as to how far the species are liable to vary: in a few instances I have been obliged to consider as distinct, forms which Mr. Edmonds evidently only regarded as varieties, but it would be indeed remarkable if the collector should be always correct in his views as to the extent of variability in each species.

It is a singular fact that since Walker's time no species of the present tribe have been described from Chili; the nearest approach to descriptions of Chilian Noctuites being found in Berg's 'Patagonische Lepidopteren beobachtet auf eine Reise im Jahre 1874' (Bull. Mosc., 1875), and in a short paper by myself on the Lepidoptera obtained at the Straits of Magellan by Dr. Coppinger, of H.M.S. 'Alert' (Proc. Zool. Soc., 1881); but none of the new species described in these two papers are identical with any of those obtained by Mr. Edmonds.

The following is an account of the species:—

LEUCANIIDÆ.

Leucania, *Ochs.*

1. *Leucania impuncta.*

Leucania impuncta, Guenée, Noct., i., p. 83, n. 117 (1852).

Var. *Leucania decolorata*, Blanchard, in Gay's 'Chili,' vii., p. 81, n. 1; pl. 4, fig. 9 (1854).

Evidently a very common species: the figure by Blanchard does not give the faintest idea of the species,

or indeed of any species ever created; but this is the case with all the Noctuites represented on his plates. It therefore becomes necessary to carefully compare the descriptions with the specimens before finally deciding that they are the insects intended by the artist.

L. decolorata is a variety in which the primaries are slightly paler than the type-form named by M. Guenée, and the secondaries whiter, with the greyish diffused outer border confined to apex or absent altogether, "posticis albidis, apice cinereis" according to the author, but the greyish border is only visible in certain lights; in others it changes to pale brassy golden.

2. *Leucania trifolii*, n. s.

Nearest to *L. convecta* of Walker (a species of the *L. extranea* group); primaries above whity-brown, with brassy reflections, more or less mottled with grey, and irrorated with minute black scales; discoidal spots ochraceous, often placed upon a dusky discoidal greyish nebula, the "orbicular" spot more or less fusiform, the "reniform" either subquadrate or D-shaped, and always with a white dot upon a short longitudinal blackish dash at its inferior margin; an oblique abbreviated dusky line from the apex, and below this a diffused brownish external border, darkest next to the line; fringe rather dusky, reddish in dark examples; the usual arched discal series of black dots, double in dark examples; secondaries above greyish, sericeous, with the veins and external border dusky; fringe stramineous at base traversed by a broad greyish stripe, and tipped with white; thorax sandy whitish, slightly tinted with grey; antennæ grey, white towards the base above; abdomen greyish brown; under surface of wings whitish, the primaries with the whole central area shining grey; costal border sericeous, sparsely irrorated with blackish; apex and fringe pale pearly brown, slightly flesh-tinted; internal border silvery white, with faint brassy reflections; secondaries with the costal and external borders slightly flesh-tinted and irrorated with grey and black; a minute linear black dot at the end of the cell; body below pale fleshy brown, very woolly; anterior tarsi black. Expanse of wings, 41 mm.

Valparaiso, September to February; at sugar.

"*Larva.*—Dull brown, with dorsal and lateral longitudinal line of paler brown; found under stones in the spring. Feeds on clover and on other larvæ."—*T. E.*"

The pale variety appears to be confined to the female sex.

3. *Leucania saccharivora*, n. s.

Allied to the preceding, but differing in colour; the primaries and thorax above being of a bright sericeous foxy-red colour; the discoidal spots indistinct, not relieved by a greyish nebula; the external border scarcely darker than the rest of the wing, crossed by abbreviated white-speckled blackish internervular lines; fringe tipped with whitish; secondaries whity-brown, with brown borders and veins; fringe rather paler than in the preceding species; abdomen grey, whitish at the base, and with reddish lateral fringes; wings below creamy white, sericeous, irrorated with black, especially upon the borders; primaries with the central area dark grey; discocellulars white; costal margin and fringe reddish, the latter traversed by two dusky lines; external border reddish, with the veins upon it white speckled with black; secondaries with a discal series of short linear dashes upon the veins, and a short linear marking at the end of the cell, black; fringe slightly yellowish at base, the apical portion reddish and black-speckled, otherwise white and traversed by a very slender blackish line; body below pale reddish brown; anterior tarsi blackish. Expanse of wings, 43—45 mm.

From five examples associated in the collection with the preceding; one of these specimens bears a distinctive number (either 6 or 9), but on referring to Mr. Edmonds' notes I find that the number is one already referred to under the Butterflies. *L. saccharivora* has the general aspect of *L. lithargyria* of Europe.

4. *Leucania chilensis*, n. s.

Allied to *L. diffusa*; upper surface whity-brown, sericeous; primaries with the veins upon the costal area more or less dusky; a forked buff-coloured line in the cell, and in some examples an oblique abbreviated blackish line between the forks; a white line just above the median vein; a buff-coloured (or sometimes blackish) looped line from the base to the middle of the interno-

median interspace; a large wedge-shaped dusky or blackish patch from the outer margin at apex to the end of the cell; a marginal series of dusky or blackish dots; fringe traversed by a grey stripe; secondaries whiter than the primaries, with pale brownish or blackish-diffused external border; fringe sericeous-white; under surface shining white, without markings. Expanse of wings, 34 mm.

Las Zorras; December and January. At light.

TRACHODOPALPUS, *Blanch.*

The following species exactly answers to the description of this genus given by M. Blanchard, but the figure of the single described species is evidently so faulty as to leave me in an unsettled state of mind as to the correctness of my identification.

5. *Trachodopalpus edmondsii*, n. s.

Primaries above greyish white, with pale cupreous reflections; the type-example with traces of a brownish angulated line beyond the middle and most distinct towards the inner margin; a marginal series of blackish spots; fringe very long, white, traversed by a blackish-brown stripe; secondaries shining white, with a marginal series of dark grey spots; fringe white, traversed by a grey line; body greyish white; wings below silvery white, with greyish disco-cellular spots; a marginal series of blackish spots; fringe traversed by a grey stripe; body sordid-white. Expanse of wings, 28 mm.

Mountains of the hacienda of Cauquenes.

XYLOPHASIIDÆ.

XYLOPHASIA, *Steph.*

6. *Xylophasia cauquenensis*, n. s.

Evidently allied to *X. patagonica* of Berg, but easily distinguishable by the absence of any trace of discoidal spots on the primaries, and by the colour of the secondaries; primaries above pale granite-grey, the veins becoming black towards the tips; an oblique abbreviated dusky line from the middle of the costal margin almost to the median vein; costal margin dusky towards

apex, interrupted by three equidistant white dots; three externally white-edged black dashes forming an oblique line near the external angle; a large ⊂-shaped white character, with blackish edges, occupying the central third of the internal area; fringe white, with dusky spots between the veins; secondaries pearly white, semitransparent, with broad diffused external border; two subcostal blackish dots placed obliquely between the end of the cell and the costal margin; subcostal area from the base to the two spots tinted with buff; body above greyish white; primaries below shining greyish white, the disc slightly dusky; a black spot at the end of the cell; fringe as above; secondaries pearly white, irrorated with blackish; a squamose disco-cellular spot and a series of short black lines on the nervures across the centre of the disc; body below creamy white. Expanse of wings, 36 mm.

Cordilleras of Cauquenes in January.

In his description of *X. patagonica* Berg says, speaking of the primaries, "Die beiden Makeln etwas heller als die Grundfarbe, fein schwarz umzogen," and of the secondaries, "nach der Basis zu schalgelb"; the latter, however, may be the subcostal buff tint noted as occurring in *X. cauquenensis*: on the under surface mention is made of "eine Querbinde auf den Hinterflügeln," whereas *X. cauquenensis* only has a series of little black lines upon the veins.

Spodoptera, *Guén.*

7. *Spodoptera aspersa*, n. s.

At first sight much like *Spælotis cineraria*, with which I found it placed; primaries above greyish brown, irrorated with dark grey and whitish scales; three black dots forming a triangle, in the centre of which is the reniform spot, which is grey and indistinct; external area dusky, its inner edge bounded upon the costa by a whitish-bordered blackish spot, and below this by four black-bordered whitish dots in a transverse series; a marginal series of minute black dots with pale brown borders; fringe traversed by two blackish lines, the outer one strongly defined and placed close to the outer edge, which is white; secondaries pearly white, semitransparent; fringe traversed by a pale grey line,

which becomes abruptly black at apex; thorax greyish brown; abdomen sordid-white; wings below with black marginal dots; primaries shining whity-brown, with white internal border; fringe grey, with slender basal and central white lines; secondaries pearly white, with sordid brown-speckled costal border; body below pale greyish brown. Expanse of wings, 32 mm.

Chili; exact locality not stated.

NEURIA, *Guén.*

8. *Neuria calligrapta*, n. s.

Primaries above lilacine grey, crossed by four irregular series of unequal dark brown and black spots, that nearest the base crossed by an abbreviated arched interrupted white line; the second and third enclosed between two black-edged white lines, the inner one angular and bisinuated, the outer one almost falciform; the fourth series, which is composed of black-tipped hastate brown spots, crossed by an irregularly zigzag white line, which is interrupted near the apex by a broad oblique white dash; costal border spotted with black and white; ordinary spots white, the discoidal spots having testaceous centres, the "orbicular" oblique and almost cuneiform; the reniform transverse and almost quadrangular; a marginal series of black lunules; fringe creamy white, traversed by a brown wavy stripe, followed by a slender wavy brown line, and with brown external edge; secondaries greyish brown, with diffused fuliginous external border; basal area whitish; fringe creamy white at base, with a broad central brown stripe and snow-white external edge: body pale greyish brown, the thorax indistinctly barred with whitish and brownish transverse stripes; under surface pale brown; wings shining, the fringe paler than above, a dusky external border; secondaries paler than primaries, with a short brown line at the end of the cell. Expanse of wings, 36 mm.

From Mr. Reed's collection.

EPISEMIDÆ.

HELIOPHOBUS, *Boisd.*

9. *Heliophobus lithophilus*, n. s.

Primaries above black-brown; costal border varying from flesh-colour to pale red-brown, marbled with darker brown; inner four-fifths of upper radial vein, the median vein, its second and third and part of its first branches, bordered with white or flesh-colour; an oblique subbasal greyish or dull flesh-coloured streak from the median vein to the base of inner margin, bounded externally by an elliptical white-edged or flesh-tinted internomedian spot and two black dashes; "orbicular" spot elongate-cuneiform, grey, sometimes black-edged and bordered with white or flesh-colour; "reniform" spot transverse, narrow, similar in coloration to the "orbicular"; internal border pale red-brown; an oblique discal streak from apex to submedian vein, whitish or flesh-coloured; fringe pale flesh-coloured, traversed by three slightly irregular greyish stripes; secondaries with a rather broad external grey border and grey veins; otherwise whitish; head creamy whitish; antennæ brown, white at base; thorax chocolate or smoky brown, the collar with slender greyish hind margin; tegulæ broadly fringed with paler brown, and enclosing a black and white longitudinal streak; abdomen greyish brown, with whitish basal and anal tufts; under surface shining sordid-white; primaries greyish, and speckled with darker scales towards the borders; secondaries speckled with grey on the costal and external borders. Expanse of wings, 30—31 mm.

Valparaiso.

"Taken at light, and the pupa found under stones; it has the spiracles very strongly marked. December and January."—*T. E.*

It is just possible that this is the species intended by Blanchard's extremely vague description of his *Noctua lineifera*; but as the identification must always remain most uncertain until the type can be examined, it has been necessary for me to name the species before me.

APAMEIDÆ.

Apamea, *Ochs.*

10. *Apamea glottuloides*, n. s.

Primaries above black-brown, with bronzy reflections; internal area mottled and irrorated with pale clay-brown, showing indications of the two ordinary lines, which are slender, black, and dentate-sinuate; an interrupted, abbreviated, black, longitudinal, basal, interno-median line; ordinary discoidal spots indistinct, outlined in white dots with very slender black outer edge, the reniform in the female marked more distinctly with a white L-shaped character; costal margin spotted with whitish beyond the middle; a submarginal series of white dots, and a marginal series of small black spots; fringe smoky brown, traversed by a black line; secondaries pearly white, with bronze-brown external border and veins; fringe silvery white, with a sordid basal line, bounded externally by a greyish line; thorax blackish; antennæ, palpi, and legs flesh-coloured, but the antennæ sometimes white towards the base; abdomen grey; primaries below shining greyish brown, with whitish internal border and dark grey fringe; secondaries pearly white; the costal area and external margin irrorated with blackish, and with a slight brown reflection; a spot at the end of the cell, and a discal series of dots upon the veins, black; tips of veins also black; body below pale brown; the pectus clothed with tufts of blackish hair. Expanse of wings, 39—41 mm.

Valparaiso.

"Taken at light, and on flowers from January to March."—*T. E.*

This species is coloured much like a *Glottula*.

Miana, *Steph.*

11. *Miana photophila*, n. s.

Primaries above sericeous greyish brown; costal border crossed by short black dashes; the central belt constricted below the cell, varied with dark brown, enclosing the usual spots, and bounded by the ordinary lines, which are black; "orbicular" spot quadrate, reddish, with white or grey border and black margin, frequently (in

the male) fused with the submedian spot, and forming with it an oblique pale dash; reniform large, ash-grey, varied with brown and black-edged; external area blackish, with hastate inner margin; two submarginal zigzag whitish lines (the inner one most distinct) interrupted by the nervures; secondaries a little paler than the primaries, excepting towards the outer margin; a blackish marginal line; fringe whitish, traversed by an undulated dark grey stripe, and tipped with the same colour; thorax dark smoky brown; tegulæ grey; abdomen greyish brown; primaries below sericeous-brown, irrorated with darker scales, the basal area whitish; costa dotted with white towards apex; a dusky spot at the end of the cell; fringe with a sandy whitish basal line; secondaries shining white, irrorated with dark brown; a spot in the cell, a larger spot at the end of the cell, and an arched discal line, blackish; a marginal series of blackish lunules; fringe greyish, with sandy whitish basal line; body pearly greyish brown, very pale; tarsi black, banded with white. Expanse of wings, 26—29 mm.

Las Zorras.

"At sugar, light, and flowers, from beginning of December to end of February."—*T. E.*

Var. *margarita.*

Differs from the typical form in having the secondaries pearly white, with smoky brown external border.

This form is about equally common with the typical one, and like it varies in the form of the ordinary spots on the central belt of primaries.

CELÆNA, *Steph.*

12. *Celæna arbuticolens*, n. s.

Primaries red-brown, with shining cupreous reflections; ordinary lines double, black, convergent towards the inner margin and enclosing the usual spots; orbicular spot small, brown, with white border and black edge; reniform, with the centre merely outlined in brown, otherwise white with black edge, transverse, and rather narrow, but fairly large; costal border crossed by short blackish dashes, and dotted with white towards apex;

outer border narrow, pale brown or blackish, edged internally by an irregularly zigzag paler or white line; a marginal series of black dots; fringe pale brown, traversed by a dusky or sometimes black crenulated stripe; secondaries pale brown, with dark external border; a slender blackish marginal line; fringe whitish or pale brown, with a stripe as on the primaries; thorax reddish brown; abdomen greyish, whitish at the base; wings below whity-brown, slightly flesh-tinted on the costal areas, and irrorated with blackish scales, an irregular abbreviated blackish discal line on all the wings, and a blackish marginal line, followed by a yellowish white line at the base of the fringe; primaries with the discoidal area greyish, the internal area whitish, the inner part of the disc just beyond the transverse line blackish; the costa dotted with white towards apex; secondaries with a black spot at the end of the cell. Expanse of wings, 24—26 mm.

Las Zorras.

"Frequents flowers of *Arbutus*."—*T. E.*

A variety of this species has the "reniform" spot placed upon a rounded blackish patch, upon which it is scarcely distinguishable; the under surface of these wings also shows a small black spot at the end of the cell: although differently numbered by the collector, the habit is the same.

13. *Celæna anthophila*, n. s.

Greyish brown, with shining bronze reflections; primaries with the subcostal area to the end of the cell whitish; two or three angular black characters in a line across the basal area; ordinary lines black, dentate-sinuate, approaching one another below the cell, the central belt bounded by these lines dusky, with the ordinary spots subquadrate, whitish with black edges; costa spotted with black and whitish; a submarginal, slightly irregular, series of small blackish-edged sagittate white spots; a marginal series of black sagittate spots; fringe pale sandy yellowish, traversed by two lines, of which the inner one is crenulated; secondaries darker and greyer than the primaries, especially towards the outer margin; a marginal series of small blackish spots; fringe paler than on the primaries, tipped with white;

collar and base of abdomen dull white; under surface pale bronzy brown; wings crossed beyond the middle by a slightly irregular blackish line; a scarcely perceptible greyish diffused band half-way between the latter and the outer margin; a slender marginal greyish line; fringe whitish. Expanse of wings, 23 mm.

Las Zorras.

"Also frequents flowers of *Arbutus*."—*T. E.*

Mr. Edmonds rightly regarded this as a distinct species.

PERIGEA, *Guén.*

14. *Perigea terranea*, n. s.

Primaries above shining bronze-brown, crossed by the usual black-edged lunulated convergent stripes bounding the central belt, which is slightly dusky, especially in the cell, and encloses the ordinary spots; orbicular and reniform spots rather large, of the ground colour, with black margins; below them, upon the interno-median interspace, are two dark black-edged spots; external area irregularly greyish, traversed by an irregular series of small black-bordered whitish characters; a marginal series of >-shaped markings; fringe whitish, crossed near its base by a dusky crenulated stripe, and tipped with the same colour; costal border crossed by short black dashes, and spotted here and there between the dashes with whitish; secondaries pearly white, washed from the middle with pale sandy yellowish, which changes to greyish brown towards the outer margin; a marginal series of grey lunules; fringe pale sandy yellowish, tipped with white, and traversed by an undulated grey stripe; thorax grey, with large black-edged dusky spots on the collar and tegulæ; head brownish; abdomen pearl-grey, with brown tufts; wings below whitish, with bronze reflections; a small blackish spot at the end of the discoidal cells, and an abbreviated transverse dusky discal line; costal area grey-speckled; fringes traversed by an undulated grey line; body whity-brown; coxæ and femora pearly; tarsi black, banded with white. Expanse of wings, 33 mm.

One male "from Reed's collection."—*T. E.*

Allied to *P. imbella* of Walker.

15. *Perigea niveopicta*, n. s.

Primaries above dark fuliginous-brown, with slight violet and bronze reflections; the ordinary black lines indistinct, the outer one denticulated; the spots enclosed by these lines also indistinct, those on the interno-median interspace only outlined in black, but the orbicular and reniform with white-dotted margins, the "orbicular" D-shaped, the "reniform" ∩-shaped, the white edging being absent from the lower extremity; a discal series of snow-white dots; a marginal series of small black spots; fringe traversed by a blackish crenulated stripe; secondaries pale shining bronze-brown; fringe whitish (white towards anal angle), traversed close to its base by an undulated dark brown stripe; body fuliginous-brown, with a slight violet tint; abdomen whitish towards the base; thorax with lateral zigzag black lines; wings below fuliginous-brown, shining, whitish at the base; a dark slightly undulated discal stripe; a marginal series of black lunules, only visible in certain lights; costal areas irrorated with dark grey scales; primaries with whitish internal border; fringe speckled with blackish atoms, and traversed by a dark crenulated stripe; secondaries with pearly whitish abdominal area; a blackish spot at the end of the cell; fringe whitish, with an undulated stripe as above, but only visible in certain lights; pectus greyish, but the hairs white underneath; the legs pinky brown, grey-speckled, and with greyish tarsi banded with whitish above; venter greyish, with pink reflections. Expanse of wings, 31 mm.

One male, taken at "Las Zorras in February."—*T. E.*

What appears to me to be the female of this species is a moth taken with a variety, or perhaps a very closely allied species, in the same locality, and separated by Mr. Edmonds under a different number: it only differs from the male in its more strongly defined markings, the ordinary lines being represented by black-edged lunular spots of the ground colour; the interno-median spots being dark as well as black-edged, and the discoidal spots white-speckled as well as white-edged; the discal series of dots is, however, less conspicuous, the dots not being of so pure a white. Expanse of wings, 33 mm.

Var. *florinda.*

Differs from the typical male in its slightly more grey-speckled primaries : the orbicular spot rounded, the discal white dots scarcely visible ; the secondaries white, with broad brown external border and veins ; three basal abdominal segments with grey-tipped blackish triangular tufts* ; tarsi above black, banded with sandy whitish ; wings below altogether whiter than in the type. Expanse of wings, 33 mm.

"Las Zorras in January on flowers."—*T. E.*

CARADRINIDÆ.

CARADRINA, *Ochs.*

16. *Caradrina dulcinea*, n. s.

Nearly allied to *C. blanda* of Europe, but altogether darker, much redder, and with broader wings ; the pale borders of the lines and of the discoidal spots yellowish ; the secondaries grey, with bronze-brown and reddish reflections, but slightly whitish at the extreme base ; below the markings are far more strongly defined, the disco-cellular spots and discal stripes being blackish ; and the external border of primaries dull whitish ; the sandy yellow areas are also replaced by pale brownish flesh-colour. Expanse of wings, 32—34 mm.

"Las Zorras, at sugar and light, in January and February."—*T. E.*

17. *Caradrina mœrens*, n. s.

Pattern of the preceding species and of *C. blanda*, but only the submarginal line distinct and creamy white, the primaries dark greyish fuliginous, with slight pinky brown reflections, and the secondaries greyish brown, paler than the primaries, and whitish at the base ; the thorax dark smoky grey, even darker than the primaries, the abdomen paler, especially towards the base ; under surface whitish ; the wings shining, irrorated with smoky grey scales, excepting upon the interno-basal areas ; costal areas slightly brownish ; markings, excepting the

* It is quite probable that these exist on all specimens when not rubbed.

disco-cellular spot of secondaries (which is black), very indistinct; venter sericeous, with slight pink reflections. Expanse of wings, 33 mm.

"Las Zorras, at sugar and light, in January and February."—*T. E.*

This species is apparently commoner than the preceding, with which it was associated by Mr. Edmonds; there cannot be any doubt of its distinctness: it may possibly be the species intended by M. Blanchard's very imperfect description of *Hadena povera*, but the white line across the primaries can hardly be the dark transverse line of that description—"hácia la extremidad *una raya transversal* ó una hilera de manchitas *obscuras*," unless the word "obscuras" is intended to apply to the spots alone.

NOCTUIDÆ.

AGROTIS, *Ochs.*

18. *Agrotis suffusa.*

Phalæna-Noctua suffusa, Gmelin, ed. Syst. Nat., i., 5, p. 2541, n. 1028.

Noctua robusta, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 75, n. 1; pl. 6, fig. 9 (1854).

This common species does not vary from European examples in Chili: what could have induced M. Blanchard to rename it, it would indeed be difficult to say.

19. *Agrotis saucia.*

Noctua saucia, Hübner, Samml. Europ. Schmett. Noct., fig. 378 (1793—1827).

Var. *Agrotis ambrosioides*, Walker, Cat. Lep. Het., xi., p. 738 (1857).

Var. *Spælotis stictica*, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 73, n. 1; pl. 6, fig. 8 (1854).

Agrotis impacta, Walker, Cat. Lep. Het., x., p. 337, n. 71 (1856).

With the typical form is also the slight variety figured by Hübner under the name of *N. æqua*, but which hardly differs sufficiently to need the separate line and brief description given to it by Staudinger; the form named by Walker *A. ambrosioides*, though it has the primaries of the latter slight variety, differs entirely in the colora-

tion of the secondaries, which are pearly white, semi-transparent, with dark brown outer border and veins; lastly, the *Spælotis! stictica* of Blanchard has the secondaries of typical *A. saucia*, but the primaries are of a greyish or reddish brown colour; the whole surface covered with fine blackish mottling, and with the discoidal spots and all the paler areas of these wings white, thus giving the wings the general appearance of lichen-spotted bark. I have seen all the forms from Europe.

20. *Agrotis hostilis.*

Agrotis hostilis, Walker, Cat. Lep. Het. xi., p. 737 (1857).
A. consueta, Walker, *l. c.*, p. 738 (1857).
A. incommoda, Walker, *l. c.*, Suppl. 2, p, 692 (1865).
Spælotis infuscata ?, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 74, n. 2 (1854).

"Valparaiso, at sugar, from September to December; larva common under stones; feeds on trefoil, dock, and various low plants."—*T. E.*

It is impossible to be certain of the identification of M. Blanchard's description.

21. *Agrotis hispidula.*

Agrotis hispidula, Guenée, Noct., i., p. 293, n. 476 (1852).

"Las Zorras, at sugar, in November and December."—*T. E.*

There is a common variety having the secondaries pearly white.

22. *Agrotis bipars.*

Agrotis bipars, Walker, Cat. Lep. Het. x., p. 334, n. 62 (1856).
A. consueta (part), Walker, *l. c.*, n. 63 (1856).

"Las Zorras, at sugar, from November to January."—*T. E.*

Walker wholly overlooked the fact that he had already given the name *A. consueta* to one New World species, when in his Supplementary descriptions he gave the same designation to another New World form. (See *A. hostilis*).

23. *Agrotis bilitura.*

Agrotis bilitura, Guenée, Noct., i., p. 285, n. 467 (1852).

Spælotis cineraria, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 74, n. 3 (1854).

Agrotis deprivata, Walker, Cat. Lep. Het., xi., p. 739 (1857).

The example described by M. Guenée was evidently somewhat rubbed, so that nothing remained of the markings excepting the two short blackish streaks, one between the discoidal spots, the other close to the base of interno-median area, of primaries. In many examples only the discoidal streak is present, and therefore it is open to question whether the name proposed by M. Blanchard should not be preferred, though his description would do almost equally well for the variety of *A. hispidula* with white secondaries.

24. *Agrotis anteposita.*

Agrotis anteposita, Guenée, Noct., i., p. 273, n. 449 (1852).

Noctua lutescens, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 76, n. 2 (1854).

Agrotis decernens, Walker, Cat. Lep. Het., x., p. 333, n. 60 (1856).

"Valparaiso, at sugar, light, and flowers, from November to March."—*T. E.*

The *N. lutescens* of Blanchard is evidently the variety with yellowish primaries; the colour of these wings varies from dark fuliginous to sordid stramineous; every gradation between the extremes is to be seen in a good series such as I have before me, but the darker forms are all females and the lighter males.

25. *Agrotis americana.*

Luperina americana, Blanchard, in Gay's 'Faùna Chilena,' vii., p. 77, n. 1; pl. 4, fig. 8 (1854).

"Las Zorras, at sugar, in January and February."—*T. E.*

This is the only Noctuid figured by Blanchard, the representation of which is fairly recognisable; many of

his species can only be identified with difficulty by comparing specimens with both figure and description.

The species is allied to *Agrotis siliginis*.

26. *Agrotis semifusca*, n. s.

Primaries whity-brown, with a golden gloss; speckled with blackish scales; the base and discoidal cell, as far as the orbicular spot, mottled with black; both discoidal spots and the costa also black; an arched discal series of black dots; external area slightly dusky, with the external border greyish brown; a marginal series of black dots, connected by a very slender undulated marginal line; fringe pale buff, traversed by a darker line, and washed with grey towards the apex; secondaries pearly white, the external area with a faint golden gloss; veins, excepting the submedian and internal and the outer margin, brown; thorax blackish; abdomen sericeous greyish brown, with whitish basal hairs and reddish brown anal tuft; primaries below glossy golden-tinted whity-brown; secondaries pearly white, with the costal area, veins, and outer margin tinted with glossy whity-brown; body sericeous greyish brown; pectus blackish in front; legs whitish, brown-speckled. Expanse of wings, 43 mm.

One example. "Las Zorras; at sugar."—*T. E.*

Has somewhat the aspect of a *Xylophasia*: it was placed in the same series with the following; from which, in addition to its very different coloration, it is readily separable by its longer wings and less strongly pubescent antennæ.

27. *Agrotis clerica*, n. s.

♂. Primaries slaty black; the two usual lines widely separated, dentate-sinuate, reversed, velvet-black with indistinct testaceous border; orbicular indistinct, sometimes obsolete; reniform also indistinct, large, outlined in velvet-black, and with more or less defined inner edging of testaceous; a submarginal series of small hastate black dashes, dotted behind with white; fringe brown, black-speckled, and traversed by an undulated black line; secondaries pearly white, with the outer border, veins, and a wavy stripe near the base of the fringe, blackish brown; thorax dull black; dorsal crest

dull ochreous, double, and undulated longitudinally; palpi tipped with testaceous; antennæ brown, with whitish ciliæ; abdomen dark ash-grey; primaries below shining bronze-brown, with silvery greyish interno-basal area; secondaries pearly white; the costal area irrorated densely with brown scales; a black dot at the end of the cell, a discal arched series on the veins, and a marginal series; body below dark fuliginous-brown; collar blackish; abdomen pale towards the base, and with a red-brown tuft on each side; tarsi above black, with brownish or white terminations to the joints, brown below. Expanse of wings, 44 mm.

♀. A little browner than the male, the secondaries especially washed with brown, but equally semitransparent to those of the male; dorsal crest apparently grey, but the example is a little rubbed on the back. Expanse of wings, 43 mm.

"Las Zorras; at sugar in December and January."—*T. E.*

This species comes nearer to *A. segetum* than to anything else I have seen; with it were placed two specimens of the variety *ambrosioides* of *A. saucia*.

28. *Agrotis mamestrina*, n. s.

Primaries of the male extremely like *Mamestra furva* both in colour and pattern, those of the female like *M. brassicæ*; but the pale submarginal line regularly sinuated; ground colour smoky brown in the male, blackish in the female, with the ordinary lines deep black with pale borders; the border of the discal line of the male snow-white upon the interno-median interspace, but not elsewhere; the ordinary spots outlined in black, the "orbicular" and "reniform" being very large, pale in the male, and placed upon a pale patch; fringe alternately black and brown, with a basal series of white fusiform dots on the brown divisions; secondaries of male pearly white, with rather broad smoky brown external border and black marginal line; fringe snow-white, dotted with brown; of female suffused throughout with smoky brown, though semitransparent, as in the male; fringe with a continuous subbasal dark brown stripe; thorax dark smoky brown; abdomen paler, tufted with white in the male; wings of male below shining

white, of female shining greyish brown, the costal and external areas broadly irrorated with black scales ; black disco-cellular spots to all the wings ; body below greyish, blackish in front. Expanse of wings, 38—40 mm.

" Las Zorras ; at sugar, from September to December." —*T. E.*

Var. *chionidia.*

♀. Differs from the typical form in having the orbicular and reniform spots snow-white, with a slight sprinkling of black scales in the middle. Expanse of wings, 39 mm.

Las Zorras.

This form has the general aspect of *Melanchra persicariæ.*

29. *Agrotis edmondsii,* n. s.

Aspect and general pattern of a *Chersotis** ; primaries above pale dove-brown, irrorated with black in the female ; ordinary lines black, with whitish borders, the inner one irregularly zigzag and interrupted, the outer one dentate-sinuate ; a series of elongated hastate discal black streaks enclosing white sagittate spots between the veins ; all the nervures whitish ; a marginal series of subconfluent lunate black spots ; fringe white, tipped with blackish ; " orbicular " spot pyriform ; reniform very large, of the normal shape ; both of these spots dark grey or blackish, with whitish borders edged with black ; submedian spot dark grey, with black margin ; secondaries snow-white in the male, sordid whitish with broad pale brown border in the female ; a marginal series of black lunules ; thorax corresponding in general tint with the primaries ; abdomen whity-brown ; under surface white, sordid in the female ; wings with blackish disco-cellular spots and a marginal series of black dots. Expanse of wings, 41—44 mm.

" Valdivia, in February."—*T. E.*

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* A comparison of the males of the two European species, *C. alpestris* and *C. rectangula*, should convince anyone that the latter is nearer to *Agrotis.*

Anomogyna, *Staud.*

30. *Anomogyna nœnioides*, n. s.

Wings above bronze-brown; primaries crossed by five lunulated whity-brown stripes, edged with darker brown, and dotted between the lunules and upon the veins with white; the second and fourth of these stripes are most prominent, and represent the limits of the central belt; the third is very slightly irregular, is placed half-way between the second and fourth, and does not cross the discoidal cell; the fifth is more irregular, with the lunules more or less angular; it represents the ordinary submarginal line; orbicular and reniform conspicuous, grey with white borders and black margins, the "reniform" being rather large and almost B-shaped; a marginal series of sagittate black spots; fringe whitish, spotted with grey; secondaries greyish and semitransparent towards the base; fringe white, tipped with grey at apex; body greyish brown; collar whitish behind, and traversed by a slightly angulated transverse black line; abdomen whitish at the base; under surface pale silky brown; primaries with slightly golden hairs in the cell, and shining greyish interno-basal area; secondaries with the interno-median area broadly pearly whitish; an indistinct dusky disco-cellular spot and discal stripe. Expanse of wings, 33 mm.

From Reed's collection.

Allied to *A. lætabilis* of Europe.

Ochropleura, *Hübn.*

31. *Ochropleura diana*, n. s.

Primaries above greyish chocolate-brown, sericeous, with faint indications of a few transverse slender dusky striations; base and costa mottled with ash-grey; two basi-costal dark brown dashes, a third just before the orbicular spot, a fourth just before the "reniform," and two almost longitudinal and very short blackish apical dashes; orbicular spot small, black, rounded, with slender cream-coloured margin; "reniform" rather large, crescent-shaped, cream-coloured; a marginal series of black dots; fringe greyish, traversed by two parallel dusky stripes; secondaries sericeous snow-white; a few blackish marginal dots; thorax chocolate-brown,

varied with ash-colour ; abdomen sericeous whity-brown ; wings below shining white, with black marginal dots ; small black disco-cellular spots ; costal and apical areas black-speckled ; primaries sordid, with an abbreviated angulated dusky streak just beyond the cell ; secondaries with sordid costal area, otherwise opaline, a discal series of black dots on the veins ; body lilacine greyish ; the anterior tibiæ and tarsi and middle tarsi ashy white. Expanse of wings, 30 mm.

"Las Zorras ; taken at light in January."—*T. E.*

ORTHOSIIDÆ.

ANCHOCELIS, *Guén.*

32. *Anchocelis carneago.*

Xanthia carneago, Guenée, Noct., i., p. 397, n. 654 (1852).

X. fulva, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 82, n. 1 ; pl. 4, fig. 10 (1854).

M. Guenée says of this species :—"Ce n'est qu'avec une certaine hésitation que je rapporte cette espêce au genre *Xanthia* ; le seul individu que j'ai vu est en trop mauvais état pour que je puisse me prononcer définitivement à son égard," but this gives M. Blanchard no excuse for his wilful alteration of the specific name, for which he gives no reason, simply quoting the *X. carneago* of Guenée as a synonym.

CERASTIS, *Ochs.*

33. *Cerastis ferruginescens.*

Cerastis ferruginescens, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 83, n. 1 ; pl. 6, fig. 10 (1854).

Two pairs. "Valparaiso, at sugar and flowers, November to March."—*T. E.*

Var. 1, *lucilla.*

Primaries of a more ash-grey tint than the typical form, with the double lines and discoidal spots more distinct ; the secondaries pure white, with narrow diffused greyish apical border and black dots. Expanse of wings, 33—36 mm.

Many lepidopterists would doubtless regard this as a distinct species on account of the startling difference of colour in the secondaries, which in *C. ferruginescens* (typical) are of a dusky (almost leaden) though semi-transparent, grey tint. I believe, however, that we have here to deal with an extremely variable species; indeed, M. Blanchard, though he figures the dark form, may be describing one of the lighter varieties, since he says :— "Las alas posteriores blanquizcas con la extremidad de un gris ceniciento."

Var. 2 with primaries rather browner than the preceding, more heavily speckled with black. One pair.

Var. 3 with primaries of a pale flesh-brown colour, dusky at the base, and with pale grey external border. Four examples.

Var. 4 with primaries sericeous whity-brown; secondaries sometimes sordid; otherwise as in the preceding. Five examples.

Var. 5 like the last, but without the usual transverse double black lines representing the central belt of primaries. One pair.

These were, as I think rightly, associated together by Mr. Edmonds; with them, however, he placed the following, which must certainly be distinct: it differs from them all in having a broad continuous black stripe close to the base of the fringe of primaries, and a grey stripe near the base of the fringe of secondaries; whereas the darkest examples of *C. ferruginescens* only show a more or less interrupted, and at the same time narrower and undulated, stripe; in coloration also it differs from all the other examples, though coming nearest to the variety last noted, in the total want of black lines across its primaries.

34. *Cerastis minna*, n. s.

Primaries dark dove-brown, with slight bronzy reflections; when seen through a lens, very finely irrorated with black towards the internal and external borders, but not coarsely mottled as in the preceding species; one or two blackish spots at the base of the cell; discoidal spots black, the "orbicular" small and almost ovoid, the "reniform" reddish-centred, pterygoid; a small black submedian dot; a few small grey spots in an arched

series, to represent the outer or discal line, and a second series close to the outer margin; an oblique subapical costal grey dash; a marginal series of black dots; fringe pale dove-brown, with a broad subbasal black stripe, followed by a slender grey line; secondaries snow-white, shining, with a marginal series of blackish spots; fringe traversed by a grey stripe; body pale sandy brown; abdomen with broad snow-white basal tufts; a broad velvet-black, slightly angular, stripe across the front of the collar (as in *C. ferruginescens*); under surface almost exactly as in *Ochropleura diana*. Expanse of wings, 34 mm.

Valparaiso.

HADENIDÆ.

HADENA, *Treitschke.*

35. *Hadena conchidia*, n. s.

Primaries above shining silver-grey, with slightly darker and partly black-edged markings as follows: a double angulated subbasal stripe, an indistinct zigzag double stripe at basal third, an acutely dentated zigzag stripe just beyond the cell, an irregularly dentate-sinuate submarginal stripe limiting the external border, which is dark grey; orbicular and reniform spots a little variable in shape, dark grey, with a narrow cream-coloured border and black margin; the reniform also with a diffused reddish spot in front; a few greyish spots on the disc beyond the dentated stripe; submedian spot whitish, outlined in black, but not present in the male example before me, and frequently wanting in both sexes; a marginal series of whitish-bordered conical black marginal spots; fringe white, grey-speckled, and with a broad basal grey stripe; secondaries pearly white, with greyish brown diffused external margin and veins; fringe white, with a subbasal grey stripe; body grey; collar with a blackish band in front; male with yellowish anal tuft; under surface as in *Ochropleura diana*. Expanse of wings, 33—38 mm.

Probably from Valparaiso.

Mr. Edmonds numbers this species as "43," but no such number occurs in his notes, which pass on from 42 to 44.

Eurois, *Hübner.*

36. *Eurois intermissa.*

Hadena intermissa, Walker, Cat. Lep. Het., xi., p. 587, n. 66 (1857).

No reference given to the number "61" in Mr. Edmonds' notes.

XYLINIDÆ.

Xylina, *Ochs.*

37. *Xylina cossoides*, n. s.

Primaries above silver-grey, transversely striated with blackish; orbicular and reniform large, slightly tinted with testaceous, and outlined in black; the orbicular not complete, the marginal black line being carried downwards with a double undulation almost to the submedian vein, then curving upwards and inwards to the base, where it turns abruptly at a very acute angle back into the cell, and terminates as it reaches the inner transverse line; the latter is blackish and zigzag; discal line blackish, dentate-sinuate, oblique, abruptly angulated at the upper radial, connected with the outer margin by the veins, which are also blackish between this line and the margin; a submarginal series of white-edged black dots; secondaries opaline-white, sordid in the female, the veins and outer border more or less dusky; fringe white, with a more or less defined undulated dusky stripe; body grey; collar with two bisinuated transverse black lines; under surface coloured as in *Ochropleura diana*.* Expanse of wings, 32 mm.

Las Zorras; taken at flowers in December.

HELIOTHIDÆ.

Heliothis, *Guén.*

38. *Heliothis armigera.*

Noctua armigera, Hübner, Samml. Eur. Schmett. Noct., pl. 79, fig. 370 (1805—24).

No reference to the number "60."

* This coloration for the under surface of the wings repeats itself in different families of Chilian *Noctuites* in a most singular manner.

PHALÆNOIDÆ.

ANNAPHILA, *Grote.*

39. *Annaphila fidonioides*, n. s.

Primaries greyish flesh-colour, clouded and striated with olive-brown, the central belt sharply defined, with black edges, its centre flesh-coloured and its borders olive-brown; in shape it somewhat resembles that of *Cidaria populata*; a large tapering subapical costal olive-brown streak; a marginal series of white-edged black spots; fringe dark brown, barred with grey between the nervures; secondaries bright orange-ferruginous; abdominal border speckled with brown; a series of three unequal black spots between the end of the cell and the abdominal margin, and two more beyond these at the anal angle; an interrupted black stripe along the outer margin; fringe dark brown, its outer half spotted with pale brown; body black, the abdominal segments narrowly edged with whitish; primaries below bright orange-ferruginous; costa spotted with brown; apex and outer margin also brown; an angulated black stripe across the wing at the end of the cell; fringe nearly as above; secondaries reddish clay-colour, mottled with black, forming three or four ill-defined parallel bands, two only of which, across the disc, can be clearly discerned; fringe as above; body blackish, grey-speckled; tarsi black, barred with white. Expanse of wings, 20 mm.

"Las Zorras, in December and January."—*T. E.*

Much as this resembles *Fidonia* in general pattern and coloration, it differs entirely in structure, the body being stouter, the antennæ simple, and the palpi very small; the only genus of *Geometrites* to which it seems structurally allied is *Scordylia*, but the pattern is altogether dissimilar, and the antennæ of *Scordylia* are considerably thicker.

PLUSIIDÆ.

PLUSIA, *Ochs.*

40. *Plusia virgula.*

Plusia virgula, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 84, n. 2 (1854).

Triphæna signata, Philippi, 'Linnæa Entomologica,' xvi., p. 293 (1860).

Nearly allied to *P. divergens* of Europe.

41. *Plusia nu.*

Plusia nu, Guenée, Noct., ii., p. 347, n. 1175 (1852).
P. depauperata, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 85, n. 3 (1854).
P. detrusa, Walker, Cat. Lep. Het., xii., p. 918, n. 67 (1857).
P. fumifera, Walker, *l. c.*, p. 919, n. 68 (1857).

Allied to the preceding species.

42. *Plusia gammoides.*

Plusia gammoides, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 84, n. 1; pl. 6, fig. 11 (1854).

An examination of the figure of this species rather hinders than assists its identification; I supposed at first that it was intended to represent some long-winged *Heliophobus*.

43. *Plusia chilensis*, n. s.

Pattern of the preceding species, but more defined, the γ-shaped marking more frequently divided at the extremity of the v, the ground colour, although different, being silvery grey instead of golden brown ("bronceadas" *Blanch.*); the secondaries distinctly whiter towards the base. Expanse of wings, 39—49 mm.

From eight examples compared with six of *P. gammoides*. *P. chilensis* comes nearest to *P. californica* of Speyer.

44. *Plusia biloba?*

Plusia biloba, Walker, Cat. Lep. Het., xii., p. 905, n. 41 (1857).

One example; possibly distinct from Walker's species, being decidedly of a more golden hue throughout; but it would be unsafe with only a single specimen, taking also into consideration that our examples are somewhat worn and faded, to regard it as another species.

HOMOPTERIDÆ.

Alamis, *Guén.*

45. *Alamis polioides.*

♀. *Alamis polioides*, Guenée, Noct., iii., p. 5, n. 1324 (1852); Blanchard, in Gay's 'Fauna Chilena,' vii., p. 80, n. 1; pl. 6, fig. 6 (1854).

The male has a submarginal white band across the primaries.

"*Larva*.—Head brown, with two small orange spots on the forehead; body ash-colour, indistinctly variegated with fine blackish and brown streaks; the centre of the back rather paler than the rest of the body; each segment with a black patch on each side of the back, forming an interrupted subdorsal line; each of these patches contains two small dull orange dots, and those on the fifth and sixth segments have also a yellow spot in the centre; short fine hairs are thinly scattered over the whole body; under side pale grey, with a black stripe down the middle; prolegs brown; claspers claret-colour; sixteen legs; first two pairs of claspers smaller than the other two pairs; loops in walking; the body tapers towards the head. Feeds on a species of *Cassia*.

"Valparaiso and Vina del Mar, September and October.

"*Pupa*.—Covered with white dust; enclosed in a very slight cocoon on the surface of the ground amongst rubbish.

"*Imago*.—Emerges end of November and December."
—*T. E.*

IX. *Further additions to* Mr. Marshall's *Catalogue of British* Ichneumonidæ. By John B. Bridgman.

[Read May 3rd, 1882.]

Having, during the past autumn and winter, had the opportunity of examining several hundred Ichneumons, it is needless to say that among so many specimens of this neglected portion of the order Hymenoptera many European species have occurred, and not only have I detected several species new to Britain, but no less than five hitherto unrepresented European genera have been added, while some few species apparently new to Science are here described. Although these additions have been made, many insects have been examined which I have been unable to name at present, more especially in the genus *Hemiteles*, which genus I believe contains less than a hundred named species, and I think I may fairly say that quite one-half of the *Hemiteles* I have seen appear to be unnamed; indeed, except Foerster's Monograph of *Pezomachus*, Thomson's treatment of the genus *Cryptus*, in his 'Opuscula,' and Taschenberg's revision of the *Cryptides*, the knowledge of this family (*Cryptides*) is but little farther advanced than it was when Gravenhorst's 'Ichneumonologia Europæa' appeared; Foerster has made an elaborate division of the genera, but unfortunately has given no idea as to the species composing his new genera. I have not, therefore, ventured to describe any new species of *Hemiteles*. I have taken several winged males which I feel quite convinced belong to the genus *Pezomachus*, but of the association of the sexes of this genus but little is known; this can only be done by breeding, and even then it is apparently but seldom that the two sexes are bred together. Two years ago I bred from a cluster of cocoons of one of the *Braconidæ* seventeen specimens of *Hemimachus fasciatus*, of which sixteen were female and one only male: last year I bred the same species from spiders' nests; there were six or seven specimens, and all were males. I also bred from another Braconid several specimens of *Pezomachus*

detritus, and all were females. The year before last Mr. Barrett sent me *P. insolens*, which he bred from *S. carpini*; all were females; whilst from another host he bred two males very like, if not a variety of, *Hemimachus instabilis*. This preponderance of one sex or the other is very unfortunate; however, I had the good fortune to find, in a box belonging to Mr. Fitch, the male and female of a bred *Pezomachus*, viz., *P. anthracinus*, the male of which is just as conspicuous amongst the known male *Pezomachi* as the female is amongst her sex.

Many of the insects I have seen have been extremely difficult to determine from the method of preparation, the majority being indiscriminately gummed down on card; many I have had to float off the mounts, examine and recard, necessitating a considerable loss of time, and sometimes some damage to the specimen. There are many Ichneumons in which it makes little or no difference if they are carded or pinned, but to recognise which method is the best for certain species or genera requires an intimate acquaintance with the distinguishing points of the insects; it is safer to pin them all, using a fairly long pin, and push the insect about halfway up the pin, and, if the wings can be prevented from folding over the back, this method leaves but little to be desired; the pin of course should be put through the centre of the mesothorax, avoiding the scutellum. In conclusion I beg to thank all those entomologists who have so kindly assisted by sending their insects for examination; especially are my thanks due to Mr. E. A. Fitch, not only for insects, but advice and the kind assistance he has always rendered me in every way in his power.

ICHNEUMONIDÆ.

ICHNEUMONIDES OXYPYGI.

Ichneumon sanguinator, Rossi.

This insect, which appears in Desvignes' 'Catalogue of Brit. Ich.,' p. 29, was placed by Marshall in his Catalogue of 1872 as a *Phygadeuon*, which is a mistake. *I. sanguinator*, Rossi, if this be the same species as *I. ruficollis*, Stephens, is a very distinct insect from *Cryptus sanguinator*, Desvignes: this Ichneumon has been taken in some numbers by Mr. Billups at Headly

Lane; when I first saw it I thought it was a variety of *I. erythræus*, but there is no doubt it is distinct from that insect. I thought it was the same species Wesmael described in his 'Tentamen,' p. 102, as *I. discrepator*. Mr. Billups had only taken the female; but Dr. Capron has since sent me a male Ichneumon for my opinion, which certainly is the male of *I. discrepator*, and this strengthens my belief that the female also belongs to the same species; so the synonymy of this species appears to be—

Ichneumon sanguinator, Rossi, Mant. ii., app., n. 85; Gr., I. E. iii., 918, ♀.
I. ruficollis, Steph., Ill., Mand., vii., 207.
I. discrepator, Wesm., Tent. 102, ♂, ♀.

Mr. Fitch saw a series of this insect in the British Museum, and called my attention to it; to him my thanks are due for the correction of the error.

ICHNEUMONIDES PNEUSTICI.

Gnathoxys marginellus, Wesm.

Ichneumon marginellus, Gr., I. E. i., 192, 48, ♂.
Gnathoxys marginellus, Wesm., Tent. 108, ♂; Misc. 57, ♂, ♀; Brischke, D. Ichn. d. Prov. W. u. O. Preus. 32; Entom. xv. 35.

This genus is new to Britain; one female was taken by Mr. G. C. Bignell at Plymbridge, near Plymouth.

CRYPTIDÆ.

Cryptus palustris, Thoms.

The male *Cryptus*, which I thought might belong to this species, is, I have no doubt, the male of *Cryptus ornatus*, Gr., described by Thomson in his 'Opuscula,' p. 506. *Cryptus ornatus* is given by Marshall as a synonym of *C. tricolor*, but Thomson (*l. c.*) makes them separate species, as Gravenhorst did, and the same course is adopted by Brischke.

Hemiteles castaneus, Tasch.

Mr. Bignell has bred two males and one female of this species from *Trichiosoma betuleti*, and as I know no description of the male I now give one.

In structure the head, thorax, and wings are like the female, but the face is covered with glistening white pubescence; the 1st abdominal segment is almost the same shape as in the female, rather narrower at the apex, and there is scarcely a trace of the punctures running into aciculations; the remaining part of the abdomen somewhat cylindrical, tapering but slightly till the 6th segment; 2nd quadrate; gastrocœli very small; 3rd rather wider than long; remainder transverse.

Palpi, a spot on the base of the mandibles, scape beneath, front coxæ and trochanters, extreme apex of middle coxæ, middle trochanters, and part of hind ones, yellow; legs red; hind coxæ, trochanters more or less, and apex of hind tarsi, black; apical joint of front and middle ones the same; stigma and nervures black; base of wings yellow; basal half of 3rd abdominal segment more or less red.

Hemiteles persector, Parfitt.

Ent. Mo. Mag., xviii., p. 184, ♀.

Hemiteles gyrini, Parfitt.

Trans. Devon. Ass. for the Advancement of Science, Literature, and Art, 1881.

Mr. Parfitt kindly sent me this insect to examine, and from that inspection I would add to his description the fellowing details:—

Head and thorax shining, impunctate, covered with longish white glistening hairs; 1st and 2nd joints of the flagellum of the female subequal, not quite four times as long as wide; 23 joints; 14th subquadrate; parapsides sharply impressed; metathorax rather densely pubescent; supero-medial area elongate; sides almost parallel, the transverse line dividing the lateral areæ only about one-third from the front part of the metathorax; 1st abdominal segment of female gradually tapering, about twice as wide at the apex as at the base; in the male almost linear, canaliculated; spiracles distinct, hardly so in the male, placed just beyond the middle; the whole abdomen sparingly covered with glistening hairs, shining, no sculpture except the hair-pits; 2nd segment rather longer than wide; 3rd slightly transverse; in the male the 2nd is one-third longer than wide; the 3rd quadrate.

The female in shape is very similar to *H. formosus*, but the 1st segment is shorter and stouter; the male at first sight resembles the male of *Orthopelma luteolator*, but is more slender.

I have taken two males of this very distinct *Hemiteles* at Brundall, Norfolk.

Nematopodius ater, Brischke.

Brischke, D. Ichn. d. Prov. W. u. O. Preus. 7, ♂, ♀.

Dr. Capron sent me a pair of this insect, which I was unable to find described until I saw the third part of Brischke's Monograph.

I took the male close to Norwich towards the end of May, 1881.

Thaumatotypus Billupsi, n. s.

Piceous. Antennæ like *Pezomachus*; 1st joint of flagellum one-third longer than the 2nd, rather more than three times as long as wide; 5th a little longer than wide, 15-jointed, the apical one conic, one-half longer than wide; head subglobose; eyes small; thorax with a distinct scutellum; meso- and metathorax subequal, hardly as long as wide; a deep rounded depression reaching well up on to the upper part of the metathorax, with indistinct lateral spines; wings wanting; 1st segment of abdomen rather long, almost linear, slightly tapering towards the apex; tubercles very prominent, placed just behind the middle; post-petiole aciculate; 2nd segment very long; aculeus hardly half the length of the 1st abdominal segment; legs slender.

Piceous; base of 1st joint of flagellum pale, abdomen slightly paler piceous; legs piceo-stramineous. Female. Length about 2 mm.

Taken by Mr. T. R. Billups, after whom I have named it, at Burford Bridge, in September, 1881.

Dr. Capron has also taken a specimen of this same genus, but as I have not seen it I cannot say if the same species.

This genus is one of Foerster's (Synopsis d. Fam. u. Gatt. d. Ichneumon), and its characteristics are: aculeus not half the length of the 1st abdominal segment, and

the 2nd segment very large. Although Foerster made the genus, I am not aware that he has described any species of it. Brischke has described one (*T. femoralis*).

Aptesis Foersteri, n. s.

Rufus; capite, metathorace, abdomineque, segmento 1° ex parte, 5—7, nigro. Antennis rufo-fuscis, basi rufis.

Head subquadrate; antennæ a little shorter than the body; basal joints of flagellum cylindrical, elongate; 1st joint about four times as long as wide; 2nd a trifle shorter; the remainder decreasing gradually to the apex; head much wider than the thorax. Thorax rather narrow, somewhat elongate; metathorax rather shorter than the mesothorax; metathorax without areæ, but a distinct posterior transverse line, the slanting part with postero-medial area decidedly, though somewhat feebly, defined. Abdomen elongate, ovate, much wider than the thorax, nearly twice as wide; apex of 2nd segment the widest part; 3rd, 4th, and base of 5th the same width; all the segments, except the 1st, transverse, this narrow, about twice as wide at the apex as at the base, tapering; tubercles distinct, rather more than twice as long as the width of the apex; aculeus a little longer than the 1st segment, or about one quarter the length of the abdomen. Wings reaching beyond the metathorax.

Head black; mouth reddish; antennæ reddish brown, first three joints pale red; thorax red; metathorax black. Abdomen red; 1st segment brownish in the greater part of the middle; 5th and following segments dark brown; aculeus red; apical one-third brown; legs red; apex of hind femora stained with brown; apical joints of all the tarsi blackish; wings with a faint smoky spot in the region of the stigma, and a similar coloured band between this and the base. Long. 3·5 mm.

One female. Brundall, Norfolk, on September 15th, 1881; by sweeping.

I have put this insect in Foerster's genus *Aptesis*, although it differs from some of his characters. Of this genus he says the joints of the antennæ are short and stout, but in this insect they are just the reverse; he also says the antennæ are always tricoloured, but in a note, except in *A. hemiptera* when they are bicoloured, as in my insect; the antennæ are more like *Agrothereutes*, but the 4th joint of hind tarsi is not notched at the apex as in that genus.

Pezomachus anthracinus, Foerst.

A small Ichneumon-like insect; is not uncommon in this country; although in form it has all the appearance of a small *Dicælotus*, the wings are those of *Hemiteles*. This insect, after a deal of trouble, Mr. Fitch found in the British Museum, in the collection of Ruthe, standing under the name of *Ichneumon gracillimus*, most likely only a manuscript name.

In a box of ichneumons, chiefly bred specimens, which Mr. Fitch sent me to look over, was the above insect, together with three females bred from *Elachista subnigrella*; and as I have not seen a description of the male, I have given it below.

Nigra, pedibus ochraceis, femoribus et tibiis posticis apice pallide piceo; abdomine piceo, segmentis anticis marginibus pallide; areola nulla.

Head subglobose; face prominent; clypeus separated from the face by a distinct line, with a circular pit at each lateral margin; mandibles bidentate; teeth subequal; antennæ two-thirds the length of the insect; flagellum subclavate; 1st joint rather more than twice as long as wide; the 2nd one-third shorter than the 1st; head and thorax finely reticulate; parapsides faintly marked in front; metathorax rugose; supero-medial area not distinct, somewhat semi-oval; lateral areæ not divided; spiracles small and circular; neuration of the wings very imperfect beyond the outer transverse cubital nervure; radial cell short and deep; legs moderate; 1st segment of abdomen slightly and gradually tapering, no tubercles, aciculate-punctate, rather wider than deep; 2nd and following densely punctured, on the 2nd the puncture flowing into aciculations, the remainder by degrees less coarsely punctured; apical segments almost smooth; the thyridii distinct, transverse and very large; styles distinctly projecting.

Black; mandibles and palpi pale ochreous; legs the same colour; front and intermediate coxæ and all the trochanters yellow; hind coxæ black; posterior part of intermediate femora, apical half of hind femora, apex of hind tibiæ, and apical joints of tarsi, more or less piceous. Abdomen piceous; extreme margins of anterior segments yellowish. Stigma and nervures pale piceous; tegulæ yellow. Length about 3 mm. Male.

Pezomachus dubitator, Foerst.

Foerst., Mon. d. Gat. Pez. 159, 105, ♀ .

A *Pezomachus*, which I believe to be this species, does not appear to be scarce in the neighbourhood of Norwich.

Pezomachus xylochophilus, Foerst.

Foerst., Mon. d. Gat. Pez. 137, 75, ♀ .

I have taken this handsome insect by sweeping on the Brundall marshes in the neighbourhood of Norwich. I have also this summer received it from Mr. T. R. Billups, who took it at Rainham, Essex; and Mr. G. C. Bignell, from the neighbourhood of Plymouth.

Pezomachus analis, Foerst.

Foerst., Mon. d. Gat. Pez. 138, 76, ♀ .

Not uncommon in the neighbourhood of Norwich. Mr. Bignell has sent the same species.

Pezomachus geochares, Foerst.

Foerst, Mon. d. Gat. Pez. 199, 158.

Mr. Billups has taken, at Deal, on the 18th April, 1881, a *Pezomachus* which I believe to be this species; it differs only from Foerster's description in having the 3rd abdominal segment black, and red only at the sides.

OPHIONIDÆ.

In the autumn I examined my species of *Campoplex* by the light of Foerster's and Holmgren's Monographs (Verhand. d. k.-k. zool.-bot. Ges. in Wien. 1868, B. xviii , Heft. iii. u. iv.; Mon. d. Gatt. *Campoplex*, Gr. von Prof. Dr. Förster; Holm., Skand. ant. af. Ophionidslägtet *Campoplex* ; Bih. till. k. Sv. vet. ak. hand. Band. 1, no. 2), when, as might naturally be expected, I found some of their species amongst my specimens, and I have little doubt but that many others still remain unnoticed in this country.

Campoplex oxyacanthæ, Boie.

Campoplex oxyacanthæ, Boie, Stett. Ent. Zeit., 16 Jahrg, 104, 43.
C. mixtus, Gr., I. E. iii., 601, part; Holm., Mon. Oph. Suec. 33, part.
C. mesoxanthus, Foerst., *l. c.*, 791, 12, ♂, ♀.
C. oxyacanthæ, Holm., *l. c.*, 60.

Campoplex falcator, Thunb.

Ichneumon falcator, Thunb., Ichn., 265.
Campoplex mixtus, Gr., I. E. iii., 601, 101, ♂, ♀, part; Holm., Mon. Oph. Suec., 33, 1, part; Foerst., *l. c.*, 863, 67, ♂, ♀; Holm., Sk. art. af. Oph. Camp. 58, 23, ♂, ♀.

Campoplex obreptans, Foerst.

Foerst., *l. c.*, 778, 2, ♀; Holm., *l. c.*, 79, 36, ♂, ♀.

Campoplex confusus, Foerst.

Foerst., *l. c.*, 341, 50, ♂, ♀; Holm., *l. c.*, 62, 27, ♂, ♀.

Campoplex erythrogaster, Foerst.

Foerst., *l. c.*, 836, 46, ♂, ♀; Holm., *l. c.*, 56, 22, ♀.

Campoplex terebrator, Foerst.

Foerst., *l. c.*, 810, 26 and 27, ♂, ♀; Holm., 34, 10, ♂, ♀.

Cymodusa flavipes, Brischke.

Brischke, D. Ichn. d. Prov. W. u. O. Preus. 37, ♂.

This species appears to be generally distributed in England. I have taken it at Wimbledon; Dr. Capron takes it in the neighbourhood of Guildford; and I have also received it from Mr. Fitch. They have all been males, and I have seen no female which was at all likely to belong to it.

Sagaritis zonata, Gr.

Under this head Holmgren, in Mon. Oph. Suec., has included *Campoplex latrator* as a doubtful synonym; Tschek, in Ich. Frag., separates them, which view is also taken by Brischke. Both species occur in this country.

Limneria virginalis, Gr.

Gr. I. E. iii., 472, ♀.

I have taken a *Limneria* in the neighbourhood of Norwich, which I have no doubt is this species; the head behind the eyes is narrow; transverse anal nervure is not interrupted; the supero-medial area of metathorax transverse; lateral areæ not divided; 2nd abdominal segment one-third longer than wide; 3rd subquadrate, or a little longer than wide. I have also taken a second specimen at Wimbledon, in which the post-petiole is not so square as the other, and the front coxæ are partly yellow. Another female has the post petiole as the last, and the supero-medial area not so wide; the front coxæ are also partly pale. These two latter may belong to another species.

Limneria clandestina, Holm.

Holm., Mon. Oph. Suec. 90, 64, ♂, ♀.

To this species I refer a *Limneria* sent to me by Mr. Fitch, which was in a large box formerly belonging to the Rev. T. A. Marshall, given to him by Mr. E. Saunders.

Limneria hyalinata, Holm.

Holm., *l. c.*, 93, 69, ♂, ♀.

Mr. J. E. Fletcher has bred both sexes of a *Limneria*, which I believe to be this species, from *Crœsus varus*.

Limneria litoralis, Holm.

Holm., *l. c.*, 69, 29, ♂, ♀.

Taken by Mr. T. R. Billups at Woking, August 1st, 1881.

Limneria concinna, Holm.

Holm., *l. c.*, 84, 55, ♂, ♀.

I have taken this pretty and very distinct species in the neighbourhood of Norwich; it has also been taken by Mr. G. C. Bignell near Plymouth.

Limneria canaliculata, Gr.

Gr., I. E. iii., 560, ♀.

Mr. D. Wheeler gave me a specimen of this *Limneria*, which he bred from larvæ brought from Wicken Fen, but as several species were mixed together, he could not say which was the host.

Head rather broad behind the eyes, scarcely narrowed; face transverse; transverse anal nervure not interrupted; supero-medial area subcordiform, not closed behind; lateral areæ not divided; 2nd abdominal segment one-third longer than wide; 3rd longer than wide.

Limneria Kriechbaumeri, n. s.

Pedibus rufis, coxis trochanteribusque nigris, metathorace brevissimo, aculeo longitudine tertiæ partis abdominis.

Head transverse, narrow behind the eyes; face densely pubescent; face quadrate; eyes slightly emarginate against the antennæ; mandibular teeth equal; thorax higher than long; metathorax very short, with no upper face, forming an inclined plane from the post-scutellum to the base of the petiole, like the rest of the thorax, reticulate, no trace of areæ, with glistening white hairs; 1st segment of abdomen almost straight; petiole slender; post-petiole longer than wide, more slender in the male than in the female, in the latter about twice and in the male one and a half times as wide as the petiole; the 2nd segment longer than wide; the 3rd and remainder transverse; apex of abdomen slightly compressed; aculeus of female about one-third the length of the abdomen. Areolet subsessile; recurrent nervure received just beyond the middle; cubital nervure without areolet; transverse anal nervure divided far below the middle, but without nervure running from the geniculation; claws of tarsi simple; apical joint of hind tarsi longer than the 4th.

Black; palpi and mandibles, except the teeth, yellow; legs red; coxæ and trochanters black; extreme base of tibiæ yellow; apex of hind tarsi somewhat fuscous, as well as apical joint of intermediate ones sometimes; stigma and nervures fuscous; base of wings yellow. Long., male and female, 5—7 mm.

Bred by Mr. G. C. Bignell, April 20th, 1882, from half-grown larvæ of *Tæniocampa instabilis*.

This insect may be said to belong as much to *Casinaria* as to *Limneria*, being without metathoracic areæ, and the inner orbits scarcely emarginate; but the aculeus is longer than in any *Casinaria* I can find described. The cocoon is chocolate, with central whity-brown zone.

Limneria rufa, n. s.

Abdomine pedibusque, maxima ex parte rufis.

Head transverse, narrow behind the eyes; antennæ rather more than two-thirds the length of the body; eyes rather deeply emarginate against the antennæ; forehead without keel or groove. Thorax slightly longer than high, rather coarsely punctured; parapsides slightly defined; the depression behind the anterior margin of the mesopleura bounded by a fine distinct line; mesopleura with scattered punctures; interstices reticulate; scutellum keeled only at the base; supero-medial area of metathorax distinct, transverse, open behind; lateral areæ divided; postero-medial almost flat, with indistinct concavity; spiracles oval. Abdomen compressed; post-petiole about twice as wide as the petiole, rather longer than wide; petiole a trifle longer than the post-petiole; the abdomen hardly compressed. Areolet with a short petiole; recurrent nervure received just beyond the middle; transverse anal not divided; transverse discoidal divided below the middle; aculeus of female hardly exserted.

Black; palpi yellow. Legs red; coxæ, trochanters, apex of front tarsi, middle and hind tarsi, fuscous; hind tibiæ more or less fuscous-red; extreme base of all the tibiæ with a minute white spot above in the male, obsolete in the female; tegulæ white; nervures and stigma black. Abdomen red; petiole brown; sides of petiole and 2nd segment slightly fuscous; anterior half of venter fuscous. Long., male and female, 9 mm.

Bred by Mr. G. C. Bignell from *Bombyx quercus*. The Ichneumon larvæ emerged from the living caterpillars. The cocoon is oval, black, and granulated on the outside.

Limneria Brischkei, n. s.

Nigra, pedibus rufis, coxis, trochanteribus et tarsis posticis nigris, aculeo brevissimo.

Head not buccated, narrow behind the eyes; face almost parallel; eyes hardly emarginate against the antennæ, a little shorter than the body; head and thorax with scattered white pubescence; 1st joint of flagellum about four times as long as wide, longer than the 2nd; thorax longer than high; areæ of metathorax not distinct, and rather imperfect; supero-medial about as long as wide; lateral areæ not divided; postero-medial coffin-shaped; metathorax rather densely pubescent, especially at the sides; 1st segment of abdomen slender; post-petiole about twice the width of the petiole, longer than wide; spiracles distinct; 2nd segment one-third longer than wide; 3rd slightly wider than long; sides of abdomen with glistening white hairs; aculeus about one-third the length of the 1st segment. Wing with areolet hardly petiolated; recurrent nervure received just beyond the middle; cubital nervure with no nervelet; external radial nervure somewhat straight; transverse anal nervure not divided. Legs red; greater part of front coxæ, middle and hind coxæ, entirely black; extreme base and apex of hind tibiæ, hind tarsi, and apex of middle one, fuscous; mouth, front and middle trochanters, and base of wings, yellow. Stigma and nervures black. Long. female, 6 mm.

Bred by Mr. Bignell from *N. triangulum*; it appears to differ from its allies in having the post-petiole slender. It comes near *L. dumeticola*, Holm., and *L. carbonaria*, Brischke.

The cocoon is rough dirty white, with no dark zones.

Limneria affinis, Parfitt.

Ent. Mo. Mag. xviii. 252.

Meloboris pusio, Holm.

Holm., Mon. Oph. Suec. 100, 2, ♀.

Amongst some ichneumons sent to me by Mr. Fitch, given him by Mr. E. Saunders, and which were formerly in the possession of the Rev. T. A. Marshall, I detected

a female and two males which I believe to belong to this species. *Meloboris* was the only one of Holmgren's genera of the *Limneria* group which had not been met with in this country; I was therefore very pleased to see it.

Mesochorus fuscicornis, Brischke.

Brischke, D. Ichn. d. Prov. W. u. O. Preus. 78, ♂, ♀.

I have bred both sexes of a *Mesochorus* from the cocoons of a *Microgaster*, which agrees exactly with Brischke's description of the above. It has also been bred by Mr. Bignell from *Apanteles nothus*, out of *A. grossulariata*, and *M. galiata*.

Mesochorus formosus, n. s.

Capite maxima, ex parte stramineo (♂) aut piceo (♀); abdomine macula media, pedibusque stramineis, tibiis posticis basi et apice nigris; stigmate albo; abdomine segmento primo apice aciculato.

Face quadrate; mandibular teeth subequal; apex of clypeus rounded, not separated from the face; antennæ rather longer than the body; 1st joint of flagellum about one-half longer than the 2nd, and about six times as long as wide; no joint quadrate. Thorax smooth, with very fine somewhat scattered pubescence; supero-medial area elongate, sides slightly curved outwards; abdomen slender; 1st segment rather longer than the hind coxæ and trochanters, aciculate at the apex, aciculations somewhat irregular; 2nd segment a little longer than wide; 3rd as long as wide; apex of the 2nd the widest part; apex of 3rd much narrower than the base; from here to the apex of the abdomen decidedly compressed. Transverse ordinary nervure interstitial; transverse anal not interrupted; recurrent nervure received before the middle of the areolet.

Male. Head and thorax palish straw; apex of teeth, and a small spot just enclosing the ocelli, fuscous; upper part of thorax, except a central blotch, the scutellum and its neighbourhood, fuscous. Abdomen fuscous, with a pale straw blotch extending from the middle of the 2nd segment to the middle of the 3rd; sides of the apex of the abdomen pale piceous; styles straw-coloured. Legs pale straw; extreme apex of hind tibiæ fuscous, the base also very faintly so. Antennæ rufo-fuscous;

scape straw. Stigma and nervures dirty white; the latter rather the darker.

The female differs from the male in having the lower part of the face dusky, and the thorax nearly entirely dark; aculeus about as long as the 1st segment. In this species, as well as *aciculatus*, the aciculations are not so decided as in *complanatus*. Length 3 mm.

Bred by Mr. G. C. Bignell from *Macrocentrus thoracicus*, out of *Noctua triangulum*, and out of *X. rhizolitha*.

The colour of the stigma easily separates this from *M. aciculatus*.

Plectiscus spilotus, Foerst.

Foerst., Ueb. d. Gatt. u. Art. d. Fam d. Plectis. 90, ♂; Brischke, D. Ichn. d. Prov. W. u. O. Preus. 94, ♂?.

I have taken two males at the end of May and middle of June close to Norwich.

TRYPHONIDÆ.

Mesoleptus antilope, Gr.

This, Brischke says, is a *Catoglyptus*, and perhaps equal to *C. pulchricornis*, Holm., which latter has been taken by Dr. Capron, and previously recorded.

Mesoleptus leucostomus, Gr.

This he places in the genus *Trematopygus*.

Mesoleptus vulneratus, Zett.

Tryphon vulneratus, Zett., Ins. Lapp. 387, 18, ♂.
Mesoleptus vulneratus, Holm., Mon. Try. Suec. 102, 6, ♂, ♀; Brischke, *l. c.*, 66, ♀.

I have received both sexes of this species from Mr. Cameron; they have "Thornhill" attached to them, so were probably captured by Dr. Sharp.

Mesoleptus similis, Brischke.

Brischke, D. Ichn. d. Prov. W. u. O. Preus. 96, ♂, ♀.

A male of this species was taken last year by Mr. G. C. Bignell in the neighbourhood of Plymouth.

Notopygus emarginatus, Holm.

Holm., Mon. Try. Suec. 115, 1, ♂, ♀.

Mr. P. Cameron has taken this species at Kingussie.

Perilissus Gorskii, Ratz.

Tryphon Gorskii, Ratz., Ich. d. Forst. iii., 127, 42, ♂.
Perilissus Gorskii, Holm., Mon. Try. Suec. 125, 10, ♂; Brischke, D. Ichn. d. Prov. W. u. O. Preus. 73, ♂, ♀.

Mr. J. E. Fletcher has bred this species from *Phyllotoma vagans*. I have taken it in the neighbourhood of Norwich.

Mesoleius difformis, Holm. ?

Holm., Disp. Syn. Mesol. Scand. 24, 59, ♀.

A *Mesoleius* bred by Mr. J. E. Fletcher agrees with this species, except that the transverse ordinary nervure is not interstitial; it was parasitic on *Cladius Brullæi*.

Mesoleius molestus, Holm. ?

Holm., Mon. Try. Suec. 147, 39, ♂, ♀.

I have a male *Mesoleius*, given to me by Dr. Capron, taken at Shere, and have seen the same species from Mr. G. C. Bignell, which agrees better with *M. molestus* than any other I can find described; but Holmgren says transverse anal nervure divided below the middle; but in those I have seen it is divided either in or just above the middle.

Mesoleius ignavus, Holm.

Holm., Mon. Try. Suec. 174, 103, ♂, ♀.

I have seen a male from Mr. Cameron, which I believe to be this species.

Mesoleius pini, n. s.

Thorace, pectore, scutelloque, flavo maculato; abdomine dorso medio rufo; pedibus rufis, tibiis tarsisque posticis fuscis, coxis anticis flavis.

♂. Black; mouth, clypeus, apex of cheeks, spot on scape beneath, upper margin of collar, triangular blotch

on shoulders, tubercles and tegulæ, lower part of prothorax, breast, this latter with a brown lateral spot, sutures between the meso- and metathorax, lateral basal margins of scutellum, post-scutellum faintly, front coxæ, and a spot on intermediate ones beneath, yellow; legs red; hind knees, tarsi, and tibiæ fuscous; the latter faintly reddish towards the base; apex of intermediate tarsi fuscous; middle of abdomen faintly reddish; apex of 2nd and remaining segments with a narrow pale margin; stigma reddish brown.

♀. Hardly differs from the male. My specimen has the post-scutellum yellow-marked, the marks on the scutellum larger, and the brown spots on the breast replaced by red ones; the coxæ more yellow, this colour extending to the hind pair; the prothorax is almost entirely yellow.

Head not buccated, slightly narrowed behind the eyes; apex of clypeus sinuous; mesopleura reticulate, with fine scattered punctures; supero-medial area of female distinct, less so in the male; postero-medial the same; keels on the 1st abdominal segment of the male distinct, extending just beyond the middle, obsolete in the female, the segment half as wide at the base as at the apex, and one-half longer than wide; 2nd in male quadrate, female transverse; the 3rd in male and female longer than wide; parapsides of mesothorax distinct. Areolet transverse, more or less petiolated; transverse anal nervure subopposite, interrupted a little below the middle.

This insect should come next of *M. sylvarum*, Holm., Disp. Syn. Mesol. Scand. 10, 19.

M. sylvarum has the coxæ black-marked, and mesopleura black; in this the latter is yellow, and the coxæ are red and yellow.

Bred by Mr. J. E. Fletcher from cocoons of *Lophyrus pini*, sent by Mr. Cameron from Scotland.

Trematopygus atratus, Holm.

Holm., Mon. Try. Suec. 181, 4, ♂; Brischke, *l. c.*, 90, ♂, ♀.

This fine species has been taken, and bred from *Crœsus septentrionalis*, by Mr. Wilson at York.

Brischke has placed *Tryphon albipes* in this genus; Marshall placed it in his Catalogue as a doubtful *Tryphon*.

Tryphon confinis, Holm.

Holm., Mon. Try. Suec. 191, 17, ♂.

I have taken a male *Tryphon*, which agrees with this species, at Brundall, near Norwich.

Besides the above-mentioned *Tryphon*, the following Gravenhorstian species, included in Marshall's Catalogue, Brischke has moved into the following genera of Holmgren :—

T. albovinctus is a *Polyblastus*.

T. colon is a *Mesoleius*.

T. fasciatus is an *Erromenus*.

T. notatus is an *Euryproctus*.

T. xanthostomus is a *Mesoleius*.

Grypocentrus incisulus, Ruthe.

Ruthe, Stett. Ent. Zeit. Jahrg. xvi., 55, 2; Holm., Mon. Try. Suec. 194, 2, ♂, ♀; Brischke, *l. c.*, 94, ♂, ♀.

I captured a specimen of this species near Norwich on the 11th of August, 1877, but did not succeed in naming it till this winter.

Grypocentrus clypeatus, Zett. ?

Tryphon clypeatus, Zett., Ins. Lapp. 399, 30, ♀.
Grypocentrus clypeatus, Holm., *l. c.*, 195, 5, ♂, ♀.

I have an insect which I believe to be this species; it was taken close to Norwich on the 9th of June, 1878.

Monoblastus Neustriæ, Ratz.

Tryphon Neustriæ, Ratz., Ich. d. Forst. ii. 115, 16, ♂.
Monoblastus femoralis, Holm., Mon. Try. Suec. 293, 2, ♂, ♀.
M. Neustriæ, Holm., *l. c.*, 385, 2, ♂, ♀; Brischke, *l. c.*, 96, ♂, ♀.

I have seen two specimens which were taken by Mr. Billups in his garden at Peckham.

Monoblastus Caproni, n. s.

Facie flava, abdominis medio rufo, pedibus nigris, tibiis, trochanteribus, genubus tarsisque anticis pallide flavis.

Head behind the eyes not or scarcely narrow; antennæ a little shorter than the body; clypeus separated from the face, sometimes obsoletely so; face wider below than above; a channel running from the anterior ocellus to the antennæ; head finely punctate. Thorax finely punctate; scutellum keeled at the sides to the middle; mesothorax somewhat trilobed in front; supero-medial area elongate; lateral areæ only partially divided; 1st segment of abdomen rather more than twice as long as wide, longer than the hinder coxæ and trochanters, about twice as wide at the apex as at the base, channelled to just beyond the middle; tubercles not prominent, placed about in the centre; 2nd and 3rd segments quadrate, the 3rd sometimes subquadrate, remainder transverse; the anterior segments somewhat coarsely punctate. Wings with an areolet, petiolated; transverse outer nervure partially obliterated; transverse ordinary nervure not interstitial; transverse anal interrupted below the middle; external radial slightly incurved in the middle. Claws distinctly and closely pectinated.

Black; scape beneath sometimes, mouth, middle of mandibles, clypeus, face, spot on cheeks below the eyes, this sometimes united with the face, front and middle coxæ and trochanters, yellow; 2nd to 4th abdominal segments red; the 2nd with two dorsal spots below the base, sometimes united into a blotch; apex of 1st segment sometimes reddish; femora black; front and middle trochanters, knees, tibiæ, and tarsi dirty yellowish white; extreme apex of hind trochanters the same colour; hind legs black; middle of tibiæ or beneath more or less pale. Stigma and nervures black; base of wings pale. Length 6·5—9 mm., male.

Taken by Dr. Capron in the neighbourhood of Shere.

This distinct *Polyblastus*, in shape, is very like the *Tryphon rutilator* group, but the heavily pectinated claws easily distinguish it from any of the true *Tryphons*.

Polyblastus Bridgmani, Parfitt.

Ent. Mo. Mag. xviii. 251.

Cteniscus hostilis, Holm.

Holm., Mon. Try. Suec. 239, 32, ♂.

I have taken a male in the neighbourhood of Norwich at the end of May, and another in the beginning of June, at Brundall; both these agree exactly with Holmgren's description of this species.

Cteniscus bimaculatus, Holm.

Holm., Mon. Try. Suec. 245, 47, ♂, ♀.

I took both sexes of this insect last autumn at Brundall, near Norwich.

Exochus septentrionalis, Holm.?

Holm., Disp. Met. Exoch. Scand. 72, 19, ♀.

Amongst Mr. Cameron's insects I found an *Exochus* which agrees with the description of this species in every respect, except the colour of the legs; these have the femora red, with the extreme apex black; the front tibiæ are red, the extreme ends black; front tarsi reddish, apex black; intermediate tarsi nigro-fuscous; the coxæ and trochanters are reddish brown, the latter red at the apex. It may be the male of this species.

Two males. Clober and Cadder.

Exochus albicinctus, Holm.

Holm., *l. c.*, 71, 17, ♂.

I have taken two specimens of this insect in June and July, 1881; the first, a male, was taken at Felthorpe, in Norfolk; the other, at Wimbledon, in Surrey, is a female, and only differs from the male and Holmgren's description in having the middle and hind tibiæ black; extreme base whitish.

Exochus decorator, Holm.

Holm., *l. c.*, 64, 3, ♂.

This species was sent to me by Mr. J. E. Fletcher, who received it from Mr. J. H. Threlfall, of Preston.

Hyperacmus crassicornis, Gr.

Exochus crassicornis, Gr., I. E. ii. 347, 221, ♀.
Hyperacmus crassicornis, Holm., Mon. Try. Suec. 322, ♀; Brischke, D. Ichn. d. Prov. W. u. O. Preus. 108, ♂, ♀.

This species has been taken by Dr. Capron in the neighbourhood of Shere during the past summer.

Bassus Holmgreni, n. s.

Abdominis medio, pedibus, antennisque rufis, trochanteribus, coxisque anticis flavis posticis nigris, facie et genis ♂, clypeo et orbitis internis ♀, flavis.

Head shining, finely punctured, narrow behind the eyes; thorax very shining; punctures almost obsolete; metathorax wrinkled; supero-medial area distinct, rather narrower in front than behind; 1st abdominal segment and base of 2nd rather coarsely scabrous; remainder obsoletely punctured; 1st segment of female rather longer than wide, slightly tapering from base to apex, grooved to beyond the middle; tubercles not distinct; 2nd and following segments transverse; 3rd the widest, slightly compressed at the apex; 1st segment of the male one-third longer than wide; the widest part of the abdomen the 4th and 5th segments. Wings without an areolet; transverse cubital nervure short; transverse anal nervure divided in or just below the middle. Legs slender.

♀. Black; antennæ red, scape beneath, black above; mouth, clypeus, a small spot just above the base of the mandibles and internal orbits, coxæ, trochanters, base of wings, and tubercles, yellow; apex of 1st segment, 2nd to 4th entirely, 5th except fuscous dorsal spot, and legs, red; base of hind ones faintly fuscous; hind coxæ, greater part and apical joint of all the tarsi, dark brown or black; stigma brown; apex yellowish; nervures brown.

♂. Only differs in having the antennæ reddish brown, scape black, apex beneath yellow; mouth, front part of cheeks, face, and inner orbits just above the antennæ, yellow; base of 2nd segment dark brown, and 5th segment almost entirely red. Length 4·5—5 mm.

This beautiful little *Bassus* belongs to Holmgren's div. ii. B. b. *a*.

I took the male at the end of June and the female at the beginning of July in Norfolk. I have also seen male and female taken by Mr. J. W. May at Esher on 28th July, 1880.

PIMPLIDÆ.

Clistopyga rufator, Holm.

Holm., Mon. Pimp. Suec. 35, ♂, ♀; Voll., Pinacog., pl. 13, fig. 7; Brischke, D. Ichn. d. Prov. W. u. O. Preus. (Schrif. d. Nat. Ges. i. Danz., Bd. v., Heft. 1, 8), ♀.

I took a female of this splendid insect at Brundall, June 3rd, 1881.

Lycorina triangulifera, Holm.

Holm., Mon. Pimp. Suec. 43, ♂, ♀.

This fine addition to our fauna was captured by Mr. G. C. Bignell in the neighbourhood of Plymouth.

Lissonota anomala, Holm.?

Holm., Mon. Pimp. Suec. 52, 11, ♀.

A specimen of this genus, taken by Mr. T. R. Billups at Wickham, comes very near to *L. anomala*, Holm., but differs from the description of that species in having the 2nd and 3rd abdominal segments rather longer than wide, and the transverse anal nervure is divided distinctly below the middle; wings hyaline; nervures black. This insect may be a variety of the above species, as Holmgren's description was taken from a single specimen.

Lissonota linearis, Gr.?

Gr., I. E. iii. 105, 59, ♀.

Mr. Billups has taken a female which agrees with this species of Gravenhorst, except that the 2nd segment is red, and the aculeus as long as the abdomen.

Head transverse, behind the eyes narrow; 1st abdominal segment with a canalicula terminating in an oblong pit in the middle of the post-petiole; the 2nd and 3rd segments rather longer than wide; remainder transverse; transverse anal nervure divided one-third from the bottom; external radial nervure slightly incurved. Stigma rather paler at the base; face parallel.

This species Mr. Marshall has placed in his Catalogue as a synonym of *L. bellator*, but Mr. Billups's specimens differs from *L. bellator* in having the punctures on the back of the mesothorax rather larger and more scattered, aculeus is shorter, face and thorax entirely black.

Lissonota deversor, Gr.

Gr., I. E. iii. 59, 32, ♂, ♀.

In Marshall's Catalogue this insect is included as a synonym of *L. irrisoria*. I think this must be a mistake; the description of the two insects are so very different. I have taken six males, and the only variation seems to be in the two central pale lines on the face, which are sometimes absent. I am inclined to think the *L. leptogaster*, Holm., is this latter variety. I once sent this insect to Mr. Marshall, and he returned it as a *Mesoleptus* which he could not name; the narrow 1st abdominal segment certainly gives it at first sight a right to a place in that genus.

Lissonota femorata, Holm.

Holm., Mon. Pimp. Suec. 55, 20, ♀.

I have taken three females in this neighbourhood which agree exactly with Holmgren's description.

Lissonota Fletcheri, n. s.

Niger, abdominis medio, femoribus, tibiis tarsisque rufis; abdominis primo segmento subaciculato.

Head transverse, slightly narrowed behind the eyes; antennæ of male rather shorter than the body, of female rather more than half the length of the body; 1st joint of flagellum rather longer than the 2nd, about three times as long as wide; cheeks slightly descending below the base of the mandibles; lower part of face and cheeks covered with fine dense white pubescence; face transverse; head, thorax, and abdomen finely and densely punctured; interstices reticulate; 1st segment of abdomen about as long as the hind coxæ, gradually tapering from base to apex, this latter about twice as wide as the base; apical portion distinctly but finely aciculate; 2nd segment quadrate; 3rd and following ones transverse; aculeus as long as the abdomen.

Areolet of wings small, petiolated; the petiole as long as the height of the areolet; transverse ordinary nervure not interstitial; transverse discoidal divided below the middle; transverse anal indistinctly divided less than one-third from the bottom.

Black; femora, tibiæ, tarsi, abdominal segments 2nd to 4th, apex of 1st and base of 5th, red; base of wings yellow; stigma fuscous. Male and female. Length 6·5 mm.

Bred from *Gelechia lentiginosella* by Mr. J. E. Fletcher, of Worcester.

X. *Synopsis of British* Hymenoptera. Diploptera *and* Anthophila; *part I. to end of* Andrenidæ. By Edward Saunders, F.L.S.

[Read May 3rd, 1882.]

Plates VII.—XI.

The *Diploptera* and *Anthophila* follow in natural order after the *Heterogyna* and *Fossores*, of which I gave a synopsis of the British species in the volume of our 'Transactions' for 1880 (pp. 201—304). I have endeavoured as much as possible to pursue the same method with regard to the analytical tables and descriptions in the Synopsis which I have now to lay before the Society, so that the two together may form a complete descriptive History of our British Aculeate Hymenoptera. In the genera *Halictus* and *Andrena* I have had to describe the species at some length, as they are often so closely allied one to another that detailed descriptions are almost a necessity, and for the same reason the analytical tables in such cases are proportionately unsatisfactory. I have, however, done my best to make them as clear as possible; and I feel sure that any one who knows the difficulty of distinguishing between some of the closely-allied species will not be surprised if in some instances he has to refer to the detailed descriptions, as well as to the tables, in order to name his insect satisfactorily.

Figures of the ♂ genitalia (armature) have been given of all the species possible in the genera, *Colletes*, *Prosopis*, *Halictus*, &c. In *Andrena*, however, the characters presented by these organs are not nearly so strongly pronounced as in the allied genera, and I have therefore not thought it worth while to figure them, except in such instances where there is some striking divergence from the ordinary type.

The number of species in the *Diploptera* exceeds by three that given by Mr. F. Smith in his 1871 Catalogue, published by this Society; whereas the *Anthophila*, to the

end of the *Andrenidæ*, show a decrease in the numbers, of twelve, since 1876, the date of publication of the 2nd edition of his British Museum Catalogue of British Hymenoptera.

The increase of three in the *Diploptera* is caused by the discovery of that number of additional species to our list. The decrease of twelve in the *Anthophila* is accounted for thus: eleven new species have been added to the list, and twenty-three of those given by F. Smith have been rejected for the following reasons: three as being of doubtful British origin, viz., *Prosopis variegata*, *P. bifasciata*, and *Halictus interruptus*; five as being stylopised forms of well known species of *Andrena*; three as being autumn broods of species which also occur in the spring; two as being males of already described females, and which had not before been properly mated; and the remaining ten as being mere forms or races which I have not thought important enough to retain as distinct species.

My thanks are due to a great many who have helped me very much in the loan of specimens, and in other ways; and I have especially to thank Professor Perez, of Bordeaux, and Mr. C. Ritsema, of Leyden, for much valuable assistance that they have given me in comparing our British specimens with those in their collections. I must also thank the Rev. E. N. Bloomfield and Rev. W. Farren White; also Messrs. Billups, Bridgman, E. P. and F. Collett, C. W. Dale, E. Parfitt, V. Perkins, and R. Service for many specimens which they have given me, and for valuable communications as to localities, &c.

HYMENOPTERA.

ACULEATA.

Hairs simple, or in some cases twisted, but not branched or plumose .. .. *Section* 1.

Hairs more or less branched or plumose, at least those on the thorax .. .. *Section* 2.

Section I.

1. Wings not folded longitudinally .. *Heterogyna—Fossores.*
2. Wings (at rest) folded longitudinally .. .. .. *Diploptera.*

DIPLOPTERA.

(2)	1.	Abdomen petiolated; 1st joint much narrower than 2nd	*Eumenes.*
(1)	2.	Abdomen not petiolated; 1st joint not much narrower than 2nd.	
(4)	3.	Intermediate tibiæ with one spine only at the apex	*Odynerus.*
(3)	4.	Intermediate tibiæ with two spines at the apex ..	*Vespa.*

Vespa, *Linn.*

Linn., Syst. Nat., ed. x., p. 572.

This is the only genus of the social wasps that we have in this country, and can scarcely be confounded with any other. The communities are composed of ♂, ♀ and ☿, and form their nests in the ground or in trees or bushes. The ♀ hybernates in an impregnated condition, and the new brood appears about August. All our species are ornamented with bright yellow markings. Labial palpi 4-jointed; maxillary 6-jointed. Wings with three submarginal cells.

(2)	1.	Thorax with brown and red markings	*crabro.*
(1)	2.	Thorax with black and yellow markings.	
(10)	3.	Eyes touching, or almost touching, the base of the mandibles.	
(9)	4.	Markings of the body all black and clearly defined.	
(8)	5.	Basal joint of antennæ black in the ♀ and ☿.	
(7)	6.	♀; 1st segment of body with a continuous black band at the base. ☿; clypeus with a black central line generally widened in front. ♂ more pubescent	*vulgaris.*
(6)	7.	♀; 1st segment with three basal spots, the central one largest. ☿; clypeus usually with only three black dots. ♂ less pubescent	*germanica.*
(5)	8.	Basal joint of antennæ yellow in front in ♀ and ☿; ♂ unknown	*arborea.*
(4)	9.	Markings of body, especially near the base, more or less undefined, fading off into markings of a brownish or reddish hue	*rufa.*
(3)	10.	Eyes not nearly touching the base of the mandibles.	
(12)	11.	Larger; no reddish colour on the body	*sylvestris.*
(11)	12.	Smaller; sides of the body at the base more or less reddish	*norvegica.*

1. *Vespa crabro*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 572; Fig. Smith, Brit. Foss. Hym., &c., p. 221; pl. v., fig. 10.

Red-brown; sides of the mesothorax and a line down the middle darker; mandibles, except the black apical margin, clypeus, face, scape of the antennæ beneath, head behind the eyes, apex of the 1st abdominal segment narrowly and regularly, apex of the 2nd widely and irregularly, and the whole of the remaining segments, except two or three spots at the base, yellow; beneath yellow; each segment with two or three brown spots; surface hairy, more densely so in the ♂, in which sex the antennæ are considerably longer than the thorax, and the joints beneath sinuate. Head and thorax punctured. Wings yellowish brown, Abdomen rather remotely punctured. Legs with projecting hairs, and covered with a fine, very short, silky pubescence; front femora in the male densely fringed beneath. Length, ♂ 23—25 mm., ♀ 25—30 mm., ☿ 18—23 mm.

Hab. This insect (our common hornet) is common in many places, and makes its nest in decayed trees or outhouses. F. Smith says that it has been found also in a bank.

2. *Vespa vulgaris*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 572; Panz., Faun. Germ., 49, 19; Fig. Smith, Brit. Foss. Hym., &c., p. 215; pl. v., figs. 13, 14, 15, 16, 17, 20.

Head finely punctured, covered with long black hairs. Eyes almost touching the mandibles, which are yellow, except at the apical margin. Clypeus yellow, with a black stripe down the middle, widening at the apex; in the ♂ this stripe is often reduced to a spot. Face above the clypeus black, with a yellow spot on each side, in the sinus of the eyes, and a transverse trapezoidal spot between the antennæ. Antennæ in the ♂ with a yellow spot on the scape. Thorax hairy, and finely punctured like the head, with a line on each side from the tegulæ to the anterior margin; a spot below the tegulæ, a spot on each side of the scutellum, two spots on the postscutellum, and two on the metathorax, yellow. Abdomen clothed with short pale hairs, yellow, with a black band at the base of each segment, the bands slightly

and angularly produced in the centre, and with a round black spot at each side of the angle; on the 2nd and following segments in many varieties the black colour is extended, so that the central angle and the black spots at its sides are united. This is generally the case in the ♂; each segment beneath with a narrow black basal band, produced at each side into a spot, or with an unconnected spot below it; sometimes also the centres of the bands are angularly produced. Genital segments of the ♂ with the sagittæ rounded at the apex, and not emarginate. Legs yellow; the femora, except at the apex, and sometimes the tibiæ inwardly, black. Length, ♂ 17 mm., ♀ 18—20 mm., ☿ 12—15 mm.

Hab. Common everywhere. The ♀ hybernates, and may often be found in the early spring; the ☿ appears most abundantly in August. Makes its nest in the ground.

3. *Vespa germanica*, Fab.

Fab., Ent. Syst. ii., p. 256; Panz., Faun. Germ., 49, 20; Fig. Smith, Brit. Foss. Hym., &c., p. 216; pl. v., figs. 18, 19, 21.

Very like the preceding, and sometimes very difficult to separate from it.

The ♂ may, however, be easily known by the very different shape of the genital organs, the sagittæ being sharply emarginate instead of rounded at the apex; the black colour also of the truncate portion of the basal segment of the abdomen does not extend on to the dorsal surface, except just in the middle and at each side, where it forms a triangular spot; the other segments of the abdomen have each a triangular spot in the middle and a small round spot on each side.

The ♀ may be known from that of *vulgaris* by the three distinct black spots on the clypeus, and by the coloration of the basal segment of the abdomen, which has, instead of the angulated band of *vulgaris*, a black diamond-shaped spot in the centre extending almost from the base of the dorsal surface to the apex, and a small, somewhat square, black spot on each side of it; the 2nd and following segments vary in the extent of the black colour, but have generally a narrow black central spot at the base, sometimes springing from a basal band, and a

round spot on each side of the central one about midway between the base and apex.

The ☿ is very difficult to separate from some varieties of *vulgaris* ☿, as the basal band of the 1st abdominal segment in the latter is occasionally broken into three spots; but when this is the case the three separate black spots on the clypeus of *germanica* will serve to distinguish it. Length, ♂ 17 mm., ♀ 18—20 mm., ☿ 12—15 mm.

Hab. Equally common with the preceding.

4. *Vespa rufa*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 572; Smith, Brit. Foss. Hym., &c., p. 217; Fig. Curtis, Brit. Ent., pl. 760.

This species, allied to *vulgaris* and *germanica* in the structure of the head, may be separated from them at once in all the sexes by the indefinite markings of the abdomen; these markings do not stand out clearly black against the yellow, but on the 1st and 2nd segments, and sometimes on the others, they are irregularly bordered with brownish red. The face is very like that of *vulgaris*, but the spaces in the sinuation of the eyes are not entirely yellow, as in that species, but have only a narrow yellow line near the apex of each. There is a good structural character pointed out by Thomson, *viz.*, that the sides of the head posteriorly are not margined in this species, as they are in *vulgaris* and *germanica*; this character, however, is difficult to see without removing the head.

The ♂ may be easily known structurally by the shape of the genital organs, the sagittæ of which are produced into a process somewhat resembling the shape of a duck's bill. Length as in the preceding.

Hab. Common and generally distributed, but not so abundant as either of the preceding.

The extent of the red colouring of the abdomen varies very much, especially in the ☿, which has sometimes, according to Smith, the first two abdominal segments entirely red.

5. *Vespa arborea*, Smith.

Smith, Zool. i., p. 170, 6, fig. 1, ♀ ; Brit. Foss. Hym., &c., p. 218, pl. v., figs. 11, 12.

I have only seen a very few ♀ of this species, but they certainly appear to be distinct from any other ♀ that I know ; the 1st segment of the abdomen is longer, and the legs decidedly thicker and more hairy ; otherwise it is like a *rufa* without the rufous edges to the black markings, with the scape of the antennæ yellow in front, and the clypeus with three black spots.

6. *Vespa sylvestris*, Scop.

Scop., Ent. Carn., p. 309 ; Smith, Brit. Foss. Hym., &c., p. 219.

The distinctive characters of this and the following species, by which they may be known from any of the preceding, is the long space between the eye and the base of each mandible. The scape also is yellow in front in all the sexes.

♂ marked much as in *vulgaris* ♂ , but with the abdomen rather less elongate, and the genital segments much smaller in proportion ; the sagittæ wide throughout, and not dilated at the apex ; laciniæ each with a curved spine. Apical segment of the abdomen entire.

♀ and ☿ with more regular black basal bands to the abdomen than in *vulgaris*, and with the surface more shining. Clypeus with only a single small central spot. Length, ♂ 15 mm., ♀ 18 mm., ☿ 15 mm.

Hab. Generally distributed and common in many places. Makes its nest generally in trees.

7. *Vespa norvegica*, Fab.

Fab., Species Ins., p. 460 ; Smith, Brit. Foss. Hym., &c., p. 220.

Smaller and shorter than the preceding, but similar to it in the shape of the head ; it may be distinguished from it structurally in having the clypeus only remotely punctured, whereas in *sylvestris* its puncturation is close. In coloration it differs considerably, having a wide central black stripe down the clypeus dilated at the apex, much

as in *V. vulgaris*, and in having the sides of the 2nd abdominal segment, and sometimes of the 1st, more or less red; this red colour is not always present, but in the ♂ is often very bright, and sometimes nearly covers the 1st and 2nd segments. Length, ♂ 14 mm., ♀ 18 mm., ☿ 12—13 mm.

Hab. North of England, Scotland, near Norwich, Devonshire, &c.

Odynerus, *Latr.*

Latr., Hist. Nat., vol. xiii., p. 346.

This genus is so well marked that I need not make many observations on its value. In colouring its species resemble *Eumenes*, but the wide basal segment of the abdomen will distinguish them at once: from *Vespa*, the only other genus of the *Diploptera*, the smaller and more elongate form and the scarcity of the yellow markings will serve at a glance to separate them, while the absence of the second spine at the apex of the intermediate tibiæ is an excellent structural distinction. All the species are black, with yellow apical bands to the abdominal segments, and there is such a general resemblance between them that I have only pointed out their distinguishing characters.

The three sections pointed out by Wesmael are natural, and have been generally recognised; these I have given in the table of species. There is now a 4th division, *Leionotus*, Sauss., but we have no English representative of it; several, however, occur in Sweden, and I have a single specimen, without locality and without indication of its captor, which belongs to this section. Without, however, further proof of its being British, I refrain from describing it. Still, I hope that some day further captures may make it possible to add the species to our list.

One of the peculiarities of the species of this genus is the transverse costate impression which traverses the 2nd abdominal segment beneath, near the base, and on this peculiarity Thomson has formed some excellent specific characters.

(2) 1. 1st segment of the body without a transverse raised line at the base; antennæ in ♂ spirally rolled at the apex .. .. Subgenus 1. *Hoplopus.*

(1) 2. 1st segment of the body with a transverse raised line at the base; antennæ in ♂ sometimes simple, sometimes reflexed and hooked at the apex.

(4) 3. Apical joint of the antennæ sharply recurved; 1st segment of the body in both sexes covered with long hairs .. .. Subgenus 2. *Ancistrocerus.*

(3) 4. Antennæ in the ♂ simple; 1st segment of the body without long hairs .. .. .. Subgenus 3. *Symmorphus.*

Subgenus I. Hoplopus.

(2) 1. Abdomen red at the base .. .. *basalis.*

(1) 2. Abdomen not red at the base.

(4) 3. ♂ with a long yellow spine on the intermediate coxæ; ♀ with a yellow spot on the clypeus .. .. *reniformis.*

(3) 4. ♂ with the coxæ simple; ♀ with clypeus black.

(6) 5. Femora of ♂ simple; thorax in both sexes truncate in front; its angles prominent .. .. .. *lævipes.*

(5) 6. Intermediate femora of ♂ dentate; thorax not truncate anteriorly in either sex; its angles not prominent.

(8) 7. Larger; markings yellow; pubescence of head and thorax denser and dark .. .. *spinipes.*

(7) 8. Smaller; markings nearly white; pubescence of head and thorax pale .. .. *melanocephalus.*

1. *Odynerus spinipes*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 573; Smith, Brit. Foss. Hym., &c., p. 203, pl. v., figs, 7, 8.

♂. Black, with the clypeus, mandibles, antennæ in front, a line between them, the prothorax in front, a narrow band at the apex of each abdominal segment except the last, more or less abbreviated on the 3rd, 4th, 5th, and 6th, yellow. Legs yellow, with the femora at the base, and the tibiæ inwardly, more or less black; ♀ similarly coloured, but with the antennæ and clypeus entirely black, and the yellow abdominal bands almost entire throughout.

Head and thorax rugosely punctured, covered with greyish black hairs. Clypeus very deeply emarginate in the ♂, slightly so in the ♀. Antennæ flattened towards the apex, and spirally curved in the ♂, somewhat clavate in the ♀; prothorax slightly rounded in front, its angles right angles, but scarcely prominent. Mesothorax about as

long as wide. Wings with their margins and the externo-medial cell more or less smoky brown; nervures dark brown. Abdomen with the basal segment rugose, and covered with black upright hairs, the following segments finely punctured; intermediate femora of the ♂ largely tridentate, the basal tooth the longest and narrowest, and rather pointing outwards, *i. e.*, away from the body; the central tooth somewhat truncate, the apical somewhat rounded on its external margin, and pointing towards the body. Length 13—14 mm.

Hab. Common in many places; its burrows, which are formed in banks, have curved, tubular entrances, composed of pieces of mud, &c., joined together.

2. *Odynerus melanocephalus*, Gmel.

Gmel., Syst. Nat., i., pt. v., p. 2760; Smith, Brit. Foss. Hym., &c., p. 205.

Very like *spinipes*, but smaller, and with the abdominal bands white or pale cream-coloured instead of yellow, the second band wider and more dilated at the sides; the pubescence of the head and thorax is less abundant, finer and pale, the tegulæ testaceous. The ♂ may be further distinguished by the shape of the intermediate femora, the central tooth being pointed instead of widely truncate; and in having a small tubercle in the centre of the 2nd abdominal segment beneath; the whole of the under surface of the segment is far less polished than in *spinipes*. The ♀ may be further known by the almost truncate clypeus, and the pale antennæ beneath. Length 9—10 mm.

Hab. Not common; Isle of Wight, Bristol, Deal, Hastings, Norwich, &c.

3. *Odynerus lævipes*, Shuck.

Shuck., Loud. Mag. Nat. Hist., n. s. i., p. 490; Smith, Brit. Foss. Hym., &c., p. 204.

The ♂ of this species may be known at once from either of the preceding by its simple intermediate femora, and by the larger and squarer vertex of its head, and its prominent prothoracic angles. The ♀, which rather closely resembles that of *melanocephalus*, may be known from it by its larger squarer vertex, its deeply emarginate

clypeus, its more truncate prothorax, with its more prominent lateral angles and narrower pale stripes ; its dark tegulæ, sometimes with a citron spot posteriorly, and the linear pale band of the 2nd abdominal segment. Length 10 mm.

Hab. Rare. Hampstead ; Bristol. Burrows in dead bramble stems, from which it may be bred.

4. *Odynerus reniformis*, Gmel.

Gmel., Syst. Nat., i., pt. v., p. 2750. Fig. Herr-Schäff., Faun. Germ. 173, 17 (*coxalis*).

The characteristic features of this species are the yellow tegulæ, post-scutellum, and lateral metathoracic spots in both sexes, the long yellow spines on the intermediate coxæ of the ♂, and the yellow basal transverse spot on the clypeus, and the wide abdominal bands of the ♀. Length 12—13 mm.

Hab. Chobham, Surrey.

Of this very distinct species only one ♂ has occurred, which I took myself at Chobham in June, 1876. I have collected frequently in the same neighbourhood since, but have never met with it again. Its yellow post-scutellum and tegulæ would distinguish it, even in the net, from its allies.

5. *Odynerus basalis*, Smith.

Smith, Cat. Hym. Brit. Mus., pt. v., *Vespidæ*, p. 58 ; Fig. Ent. Annual, 1869, fig. 1, front. fig.

Black ; basal segment of the abdomen with a large red spot on each side in the ♂ ; almost entirely red in the ♀ ; ♂ with only the last two joints of the antennæ recurved.

♂ coarsely punctured ; a spot between the antennæ, the clypeus, the scape beneath, a line in the lower part of the sinus of the eye and a small spot behind each eye, the prothorax in front, the tegulæ, a double spot at the apex of the scutellum, and an apical band to the first five abdominal segments, pale yellow ; the 2nd abdominal band slightly widened at the sides ; flagellum beneath, 1st segment of the abdomen at the sides and beneath, and all the legs, reddish testaceous. Wings dusky. Clypeus rather deeply emarginate at the apex. Legs simple.

♀ differs from the ♂ in having the clypeus black, and sometimes with a transverse yellow band at the base, in having the posterior margin of the post-scutellum, as well as that of the scutellum, yellow, and in having the red of the basal segment more extended; the apical bands of the abdominal segments are also wider, and the whole insect rather more robust. Length 12—13 mm.

Very rare. ♀ Stowborough Heath (Rothney); ♂ Isle of Portland (C. W. Dale).

Subgenus II. Ancistrocerus.

(2)	1. 2nd segment of body beneath slightly raised towards the base, then falling abruptly to the level of the transverse crenate sulcature ..	*callosus.*
(1)	2. 2nd segment of body beneath not raised towards the base, and not abruptly truncate above the basal sulcature.	
(4)	3. 2nd segment of body beneath not longitudinally convex; costæ of basal sulcature short	*parietum.*
(3)	4. 2nd segment of body beneath more or less convex longitudinally; costæ of basal sulcature long.	
(6)	5. Concavity of metathorax, above the insertion of the body, somewhat shining	*Antilope.*
(5)	6. Concavity of metathorax quite dull.	
(8)	7. Mesothorax, between the tegulæ, longer than wide	*trifasciatus.*
(7)	8. Mesothorax, between the tegulæ, not so long as wide.	
(10)	9. Body with only three yellow bands	*trimarginatus.*
(9)	10. Body with many yellow bands.	
(12)	11. Basal segment of body wide; its apical band in the ♀ linear throughout	*pictus.*
(11)	12. Basal segment of body narrow; its apical band in the ♀ largely and suddenly dilated at the sides ..	*parietinus.*

6. *Odynerus callosus*, Thoms.

Thoms. Opusc. Ent. i., p. 87; Hym. Eur., pt. 3, p. 61; = *quadratus*, Smith, Brit. Foss. Hym., &c., p. 207 (nec Panz. ?).

Black; mandibles, clypeus, entirely in the ♂ and sometimes with two spots in the ♀, scape of the antennæ in front and a spot between the antennæ in both sexes, and a spot on each side of the prothorax, two small spots on the tegulæ, and sometimes a spot below the wings, two spots on the scutellum, a wide apical band on each abdominal segment, the basal one widely and squarely

notched in the middle, the tibiæ and tarsi, yellow; the apices of the tibiæ inwardly black in the ♀ : these markings are very subject to variation.

The character by which this species may be at once distinguished is the form of the 2nd abdominal segment beneath ; this, as in all the other species, has a transverse sulcature situated at a little distance from its base, traversed by numerous longitudinal costæ ; from the level of these costæ the surface of the segment on the side towards the apex rises suddenly at right angles to the costæ, the ventral surface again being at right angles, so that the ventral surface and costæ are parallel to each other on different levels. This character is easily visible if the insects be looked at sideways, and appears to be always well maintained. Length 9—13 mm.

A very common species, but generally confounded with the following.

The shape of the basal band *alone* is valueless, as the same shape occurs in *parietinus*, and sometimes in *parietum*.

7. *Odynerus parietum*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 572; Smith, Brit. Foss. Hym., &c., p. 206.

Very like the preceding, but rather more robust, and so variable in coloration that no dependence can be placed on that character ; the basal band of the abdomen, however, as a rule, is angularly, not squarely, notched in the centre. The form of the 2nd abdominal segment beneath will separate it at once from its allies ; the ventral surface of the body, on the side of the costate sulcature towards the apex, at its point of juncture with it, is actually below the level of the costæ instead of rising up angularly to a higher level ; the ventral surface is quite flat *longitudinally*, not convex as in all the following species. Length 8—14 mm.

Hab. Very common.

8. *Odynerus pictus*, Curt.

Curt., Brit. Ent. iii. 138 ; Smith, Brit. Foss. Hym., &c., p. 209.

This species differs from either of the preceding considerably in colour, although some dark males of *parietum*

might be confounded with it. The thorax is generally entirely black, with the exception of a narrow line on the prothorax, and two spots on the tegulæ of the ♀; the bands of the abdomen are all linear throughout and narrow; there is one on each of the first five segments, and a spot on the apex of the 6th in the ♀; the tibiæ and tarsi are pale, more or less tinged with red. The 2nd segment of the abdomen beneath is convex longitudinally beyond the costate sulcature, and its ventral surface thereby considerably above the level of the costæ. The basal segment of the abdomen also is unusually broad in this species. Length 10—13 mm.

Hab. Not common. Wandsworth; Bristol; Portland; Isle of Wight; Weybridge.

Very like the following, but distinguishable, as pointed out under its description.

9. *Odynerus trimarginatus*, Zett.

Zett., Ins. Lapp., p. 456; Smith, Brit. Foss. Hym., &c., p. 209.

Very like *pictus*, but differing in having only three abdominal bands, and the basal segment of the abdomen narrower in proportion to its length. Length 10—13 mm.

Hab. Widely distributed. Walmer and Kingsdown, Kent; Lowestoft; Littlehampton; Hayling Island; Loch Rannoch, Perthshire.

10. *Odynerus trifasciatus*, Oliv.

Oliv., Enc. Meth. vi., p. 688; Smith, Brit. Foss. Hym., &c., p. 208.

Very like *parietum* and *parietinus* in colour, but more elongate, the thorax being decidedly longer than in any other species of the section; the tibiæ are widely black at the apex inwardly, and narrowly fuscous at the base in the ♀, black in the ♂; the abdomen has three yellow bands, and sometimes an indication of a 4th; the basal band generally dilated at the sides. Length 8—12 mm.

Hab. London district, &c.

Easily recognised by its elongate shape.

11. *Odynerus antilope*, Panz.

Panz., Faun. Germ. 53, 9; Smith, Brit. Foss. Hym., &c., p. 210.

Larger than any of the preceding species, and distinguishable from either *trimarginatus* or *trifasciatus* in having a yellow band on each of the first four segments in the ♀, and of the first six in the ♂; from *pictus* it differs in having a narrower basal segment to the abdomen, with a wider, usually trisinuate, apical band, and in having the tibiæ black at the apex inwardly.

The chief characteristics of the species are its large size and shining metathoracic concavity. Length 14—18 mm.

Hab. Not common near London. F. Smith says "abundant in Yorkshire"; it has also been taken at Lynn, Norfolk.

12. *Odynerus parietinus*, Linn,

Linn., Faun. Suec., ed. ii., p. 418; Fig. Curt., Brit. Ent. iii., 137.

Very like *callosus* in the shape of the basal band of the ♀, but almost as large as *antilope*. All the segments have apical bands. It may be known from either *parietum* or *callosus* by the shape of the 2nd ventral segment; from *pictus* by the narrow basal segment; and from *antilope* by the dull metathoracic concavity. Length 12—16 mm.

Hab. Chobham; Norwich; Dorsetshire; Charlwood, Surrey, &c. Probably common, but mixed with *parietum* or *callosus*.

Subgenus III. Symmorphus.

(2) 1. Larger; sides of mesothorax shining and almost impunctate .. .. *crassicornis.*

(1) 2. Smaller; sides of mesothorax punctured.

(4) 3. Three abdominal bands only; anterior angles of the thorax not mucronate .. .. *sinuatus.*

(3) 4. Many abdominal bands; anterior angles of thorax mucronate .. .. *gracilis.*

13. *Odynerus crassicornis*, Panz.

Panz., Faun. Germ. 53, 8; Smith, Brit. Foss. Hym., &c., p. 200, pl. v., fig. 4.

Black; shining, with a very short brownish grey pubescence on the head and thorax. Mandibles and clypeus in the ♂, a spot only on the clypeus in the ♀, the scape of the antennæ beneath in both sexes, a spot on each side of the prothorax, the tegulæ and a spot under the wings, two spots on the scutellum, and a wide sinuous band on each abdominal segment, ferruginous-yellow; femora black, their apices and the tibiæ and tarsi ferruginous. Head and thorax rugosely but shallowly punctured. Scutellum and basal segment of the abdomen very largely punctured; the remaining segments more finely so. Metathorax very rugose. Wings dusky; basal segment of the abdomen campanulate, with a rugose central impression; 2nd segment considerably wider than the 1st. Length 12—14 mm.

Hab. Rare. Darenth, &c. I have specimens from Shuckard's collection without note of locality.

14. *Odynerus gracilis*, Brullé.

Brullé, Exp. Mor. Ins. iii., pl. l., f. 3; Smith, Brit. Foss. Hym., &c., p. 202 = *elegans*, Wesm.

Much smaller than the preceding, and with bright pale yellow markings; ♂ with five and ♀ with four abdominal bands; prothorax sharply truncate in front, its angles produced and acute; mesothorax below the wings punctured, and with a yellow spot, surrounded by a crenate impression; tibiæ with a black spot near the apex inwardly. Length 8—11 mm.

Hab. Common in many places.

15. *Odynerus sinuatus*, Fab.

Fab., Ent. Syst. ii., p. 270; Smith, Brit. Foss. Hym., &c., p. 201 = *bifasciatus*, Wesm.

Very like *gracilis*, but differing in the absence of the band on the 3rd abdominal segment, in the more rounded front margin of the prothorax and the less prominent angles, and in the want of the crenate impression on the mesothorax below the wings.

Hab. Generally distributed.

Eumenes, *Latr.*

Latr., Hist. Nat. xiii. 360.

Like *Odynerus* in coloration, but at once distinguishable by the narrow 1st segment of the abdomen, which is not nearly half as wide as the following one. Antennæ of the ♂ terminating in a hook.

1. *Eumenes coarctata*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 573 ; Smith, Brit. Foss. Hym., &c., p. 197, pl. v., fig. 2.

Black ; rugosely punctured ; head and thorax and 1st abdominal segment covered with short brownish hairs. Clypeus entirely in the ♂, with only a spot at the base in the ♀, prothorax with a line in front, tegulæ, post-scutellum, a spot under each wing and on each side of the metathorax (occasionally), a band at the apex of the first four abdominal segments, a spot on each side of the 2nd segment and sometimes also of the 1st, yellow. Femora black, their apices and the tibiæ and tarsi yellow. Wings brown along the region of the externo-medial cell. Head, thorax, scutellum, and 1st abdominal segment closely and rugosely punctured ; the last narrowly petiolated at its base, and campanulate, with a slight longitudinal central channel, its apical margin smooth, raised, and yellow ; 2nd and following segments punctured, but much less rugosely so than the first, and more or less shining, covered with a short pubescence. Length 13—15 mm.

Hab. Local. Chobham ; Blackwater, and Parley Heath, Hants ; Sandhurst, Berks ; Sunning Hill ; Weybridge.

Section II.

Hairs of body more or less plumose or branched.

1. Tongue obtuse, emarginate at the apex .. .. .. *Obtusilingues.*
2. Tongue acute .. .. *Acutilingues.*

OBTUSILINGUES.

(2) 1. Three submarginal cells ; thorax densely hairy .. *Colletes.*
(1) 2. Two submarginal cells ; thorax almost naked .. *Prosopis.*

Colletes, *Latr.*

Latr., Hist. Nat. iii., p. 372. For figures of generic characters see F. Smith, Catal. Brit. Hym., 2nd ed., pl. vi.

Tongue short, bifid; labial palpi 4-jointed; maxillary 6-jointed; anterior wings with three submarginal cells.

The species in this genus of obtuse-tongued bees bear a very close resemblance to each other; they have all more or less pale apical bands to the abdominal segments, and have the head and thorax densely hairy. The hairs, when examined under a microscope, are amongst the most beautifully branched of any of the *Mellifera*.

(10)	1.	Small species, 8—10 mm. Abdomen with distinct apical bands to the segments.	
(9)	2.	1st segment of the abdomen closely punctured.	
(4)	3.	♂ with the 6th segment beneath deeply foveated on each side; the foveæ small and well defined. ♀ with the surface of the abdomen shining; 1st segment somewhat finely punctured; the segments testaceous at the apex	*succincta.*
(3)	4.	♂ with the 6th segment beneath more or less largely impressed at the sides, or simple. ♀ with the 1st segment dull and coarsely punctured, or with the apices of the segments black.	
(8)	5.	♂ with the 6th segment beneath impressed on each side and subfoveated. ♀ with the hairs of the thorax bright brown; the abdomen scarcely shining.	
(7)	6.	♂ with the 6th segment shining beneath, not deeply punctured; the other segments beneath depressed and shining, fringed only at the sides. ♀ with the abdomen dull; 1st segment clothed on its basal half with long pale hairs	*fodiens.*
(6)	7.	♂ with the 6th segment beneath less shining, strongly and largely punctured; the apical fringes of the other segments complete. ♀ with the abdomen less dull than in No. 6; 1st segment naked, except at the extreme base	*picistigma.*
(5)	8.	♂ with the 6th segment beneath simple. ♀ with the hairs of the thorax dull greyish brown. Abdomen somewhat shining	*marginata.*
(2)	9.	1st segment of the abdomen finely and remotely punctured	*Daviesana.*
(1)	10.	Large species, 14—15 mm. Abdomen with only very indistinct apical bands to the segments ..	*cunicularia.*

1. *Colletes succincta*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 576; Smith, Cat. Brit. Hym., 2nd ed., p. 3.

Head and thorax clothed with pale brownish hairs, paler under the wings and underneath the head. Abdomen black; ♂ with a pale ochreous band at the apex of each of the first six segments; ♀ with the apex of each segment narrowly testaceous, and with a narrow whitish band. Legs with pale hairs.

♂. Subelongate; head finely punctured. Antennæ with the basal joint covered with long hairs; each joint of the flagellum distinctly longer than wide; mesothorax and scutellum largely and deeply punctured; metathorax rugose. Abdomen closely punctured, coarsely on the basal segment, finely on the rest; the basal segment also clothed with long pale hairs, especially at its base. Beneath rather shining and punctured, the segments not depressed, the pubescent bands at the apex of each entire; the 5th segment slightly emarginate; the 6th with a small deep transverse fovea on each side. Tarsi with the joints considerably longer than wide, clothed with a few long hairs and pale spines round the apex of each joint. Genitalia with the stipites stout, and bearing a narrow hairy appendage at the apex. Sagittæ wide at the base and converging to the apex, with a narrow membranous wing-like appendage near the apex; (see pl. vii., fig. 14).

♀. Larger and more robust than the ♂. Head and thorax clothed much the same as in that sex, but the clypeus less densely; cheeks between the eyes and the mandibles slightly longer than in the following species. Abdomen more or less shining; basal segment finely and closely punctured; the 2nd and following still more finely; each segment bears at the apex a narrow band of whitish hairs, and the basal segment is clothed with long pale hairs at the base. Length 9—11 mm.

Hab. Generally distributed and often common.

2. *Colletes fodiens*, Kirb.

Kirb., Mon. Ap. Angl. ii., p. 34, pl. xv., fig. 1; Smith, Cat. Brit. Hym., 2nd ed., p. 4.

Very like the preceding, but differs in having the antennæ of the ♂ shorter; the 6th ventral segment of the

abdomen without a deep fovea on each side, but with a slight wide depression; all the segments beneath very shining and flat, each with the apical half slightly impressed; the pubescent bands interrupted in the centre; genitalia with the sagittæ narrow and winged nearly throughout their length; the stipites much narrower than in *succincta*, and longer in proportion to the length of the sagittæ (see pl. vii., fig. 1). Tarsi with the joints much wider than in *succincta*, nearly as wide as long; the legs altogether much more hairy than in that species.

The ♀ differs from *succincta* in the more brightly-coloured hairs of the thorax, in the dull, much more rugosely punctured, abdomen, the concolorous margins of the segments (although the basal segment is sometimes narrowly testaceous at the apex), the wider and more ochreous coloured abdominal bands, and the shorter cheeks between the eyes and the mandibles, the clypeus more densely clothed with hairs and slightly emarginate. Length 9—10 mm.

Hab. Sandy commons, &c.; generally common.

3. *Colletes picistigma*, Thoms.

Thoms., Hym. Scand. ii., p. 165 = *marginata*, Schenck, nec Smith.

So like the two preceding that it is only necessary to point out its distinguishing characters.

The ♂ may be known from that of *succincta* by the shorter antennæ, the absence of the small deep foveæ in the 6th ventral segment, and the different genitalia, as shown in pl. vii., fig. 3; from *fodiens* by having the segments of the body beneath with complete apical fasciæ, their surface less shining, and not quite so flat, the 6th segment beneath largely punctured, with a large shallow marginal depression on each side near the apex, leaving the disk raised, and by the very different genitalia.

♀ differs from *succincta* in having the dull close puncturation of *fodiens*, and the concolorous margins of the segments; from *fodiens* it differs in the deeper black colour of the abdomen, and in its slightly wider and shorter form, in the absence of long pale hairs on

the basal half of the 1st segment, and in the white colour of the apical bands. Length 9—10 mm.

Hab. Southwold, Hastings, Hampshire, Littlehampton, Hayling Island, Norwich, &c. I expect that this is a common species, but overlooked.

4. *Colletes marginata*, Smith.

Smith, Zool. iv. 1277 ; Cat. Brit. Hym., 2nd ed., p. 4 = *balteata*, Nyl., Thoms., &c.

Smaller than any of the preceding, but similar in general appearance.

The ♂ may be known from all its allies by the simple 6th ventral segment, which is not foveated at the sides, and has a slightly raised dorsal line ; the other segments have the apical bands entire, and the surface punctured and convex. The genitalia are quite different from those of any other species, the sagittæ being produced at each side into a curved wing-like appendage, above which, near the base, projects a strong angular tooth. See pl. vii., fig. 13.

The ♀ is very like the others of the genus, but, besides being smaller, it has the hairs of the thorax of a duller brown colour, the surface of the abdomen slightly shining, and the clypeus and face less hairy ; the 1st segment of the abdomen is largely and rugosely punctured, and clothed with scattered pale hairs at the base ; the 2nd segment has a wide basal band of pubescence ; this is often the case also in *fodiens*, and at the sides in *picistigma*, but in them the band is made up of short, very thick, somewhat scale-like, hairs, whereas in this species the hairs are of the ordinary type (with short lateral branches). Length 8—9 mm.

Hab. Littlehampton, Isle of Wight, &c. I have several males of this species, but have only seen one British example of the female.

5. *Colletes Daviesana*, Smith.

Smith, Zool. iv. 1278 ; Cat. Brit. Hym., 2nd ed., p. 5.

Shining, black. Head and thorax somewhat remotely punctured, covered with dull brownish hairs, paler on the face and under the wings ; metathorax rugose. Abdomen shining ; 1st segment very finely and remotely

punctured in the ♀, less finely but rather remotely in the ♂; the other segments very finely and closely punctured in the ♀, not quite so closely in the ♂; each segment with a narrow greyish brown band at the apex in both sexes; the basal segment in the ♂ covered with very long erect hairs, the others with shorter hairs; the abdomen of the ♀ is also clothed with erect hairs, but they are much shorter than in the ♂; legs covered with greyish hairs. Genitalia of the ♂ with the sagittæ very much produced, forming two concave knife-like blades, quite unlike those of any of the other species. See pl. vii., fig. 15. Length 8—9 mm.

Hab. Common in many places. Hastings, Littlehampton, Charlton, Reigate, &c.

A very distinct species, easily known from the other smaller species by the shining surface of the body and the remote puncturation.

6. *Colletes cunicularia*, Linn.

Linn., Faun. Suec., ed. ii., p. 422; Smith, Cat. Brit. Hym., 2nd ed., p. 6.

♂. Black-brown, densely covered with brown hairs, those of the face and under side paler. Antennæ reaching not quite to the scutellum; head finely rugose; thorax with its surface somewhat shining and largely and remotely punctured; nervures of the wings brown. Abdomen oval, slightly shining, finely and somewhat remotely punctured on the basal segment, more closely on the following; each segment very hairy, with the apical hairs slightly paler than the rest; legs with pale hairs. The genitalia are figured at pl. vii., fig. 2.

♀ broader than the ♂, and the abdomen wider at the base, and more pointed at the apex, its puncturation finer; hairs of the face sooty brown. Antennæ much shorter; legs clothed with pale hairs on the side towards the body, and darker hairs outwardly. The entire insect having much the appearance of an ordinary hive bee. Length 14—15 mm.

Hab. Sand-hills near Liverpool.

A large species which cannot be confounded with any other.

Prosopis, *Fab.*

Fab., Syst. Piez., p. 293. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd ed., pl. vi., and for figures of 7th and 8th ventral segments of all the species see this vol., *antea*, pl. vi.

Tongue short, obtuse, somewhat bifid. Maxillary palpi 6-jointed; labial palpi 4-jointed; anterior wings with two submarginal cells.

A genus of small coal-black bees, with scarcely any pubescence, and with the abdomen generally shining and polished, the tibiæ generally more or less variegated with yellow; the face in the ♂ white, except in one species (*cornuta*), in the ♀ generally with two yellow spots.

(2) 1. ♂; face black, excavated and shining above the insertion of the antennæ. ♀; face with two short spines .. .. *cornuta.*

(1) 2. ♂; face white. ♀; face simple.

(6) 3. 1st segment of abdomen with no lateral white pubescence at the apex.

(5) 4. Scape of antennæ in ♂ flattened, dilated, and white anteriorly. ♀; spots of face nearly round, situated in the middle just below the antennæ .. *dilatata.*

(4) 5. Scape of antennæ in ♂ not flattened and dilated. ♀; spots of the face more or less lateral.. .. *communis.*

(3) 6. 1st segment of abdomen at the apex with a narrow line of silvery pubescence at each side.

(10) 7. Larger species. ♂ with the extreme base only of the 1st joint of the hind tarsi pale; ♀ with the 1st segment of the abdomen largely and somewhat closely punctured.

(9) 8. Face longer in both sexes. ♂ with the white colour extending high above the insertion of the antennæ at the sides; mandibles with a white line. ♀ with two long narrow spots along the margins of the eyes, extending from above the antennæ almost to the base of the mandibles .. .. *punctulatissima.*

(8) 9. Face shorter in both sexes. ♂ with the white colour not extending above the insertion of the antennæ; mandibles black. ♀ with a white spot on the margin of the eyes, sometimes wanting .. *signata.*

(7) 10. Smaller species. ♂ with the whole, or nearly the whole of the basal joints of the posterior and intermediate tarsi yellow. ♀ with the 1st segment of the body very finely or irregularly punctured.

(16) 11. Scape of the antennæ in the ♂ more or less swollen; spots of the face in the ♀ subtriangular or linear, lateral, and parallel in direction to the inner margins of the eyes.

(15) 12. Antennæ longer. Scape of ♂ less swollen; face hairy, or mandibles with a pale line. ♀; thorax with two yellow spots on the anterior margin; vertex of head not incrassate.

(14) 13. Face in ♂ hairy; 1st segment of abdomen shining, very largely and remotely punctured; mandibles black. ♀; flagellum of antennæ pale beneath.. *hyalinata.*

(13) 14. ♂; face not hairy; 1st segment of abdomen dull, finely punctured; mandibles and scape of antennæ with a pale yellow line. ♀; flagellum entirely dark .. .. *confusa.*

(12) 15. Antennæ shorter; scape of ♂ very much swollen; face not hairy; mandibles entirely black. ♀; thorax not spotted in front; vertex of head incrassate .. .. *brevicornis.*

(11) 16. Scape of antennæ in ♂ not thickened, its sides subparallel; basal segment of abdomen dull, largely and closely punctured. ♀; face round; spots of the face suboval and placed diagonally .. .. *pictipes.*

1. *Prosopis cornuta*, Smith.

Smith, Trans. Ent. Soc. Lond. iv., p. 32, pl. iii., figs. 2 and 4; Cat. Brit. Hym., 2nd ed., p. 9; ♂ = *plantaris*, Sm.

Black, shining; face black in both sexes; ♂ with the antennæ, except the scape posteriorly and a line along the back of the flagellum, the anterior tibiæ in front, the base of the tibiæ in the other pairs, and all the tarsi, yellow. ♀ with only the flagellum beneath fulvous, a narrow band at the base of each of the tibiæ, and sometimes two spots on the collar yellow.

Head punctured, ♂ with a shining impression above the insertion of the antennæ; scape much widened and fringed with long pale hairs; when the antennæ are thrown back these widened scapes entirely hide the polished impression, and appear exactly to fit into it; in the ♀ the antennæ are simple, but the clypeus is raised at its base, and has an angular projecting tooth on each side. Thorax dull, closely and finely punctured, scutellum more largely and remotely; metathorax rugose. Abdomen very shining and polished, deeply punctured on the 1st and 2nd segments; tibiæ short, the intermediate pair somewhat dilated; intermediate tarsi with the basal joint in the ♂ produced at its base, in front, into a rounded projection. Genitalia of the ♂ with the stipites truncate at the apex, with very long projecting hairs; 8th ventral segment terminating in two divergent processes, fringed at the apex; 7th produced at the sides

into a wing-like appendage. See pl. vii., fig. 4. Length 6—7 mm.

Hab. Very rare. Reigate; Hastings; Cove Common, Hants, &c.

The black face of the ♂, with its pilose scape and the extraordinary genitalia, and the spinose face of the ♀, distinguish this species from all the others of the genus.

2. *Prosopis dilatata*, Kirby.

Kirby, Mon. Ap. Angl., vol. ii., p. 39; Smith, Cat. Brit. Hym., 2nd ed., p. 8; Fig. Smith, Trans. Ent. Soc. Lond., iv., pl. iii., fig. 1.

Black; ♂ with the face below the antennæ, the dilated portion of the scape in front, the flagellum, except a line at the back, yellow; ♀ with the antennæ fulvous beneath, and a round yellow spot just under the insertion of each antenna; tegulæ and tubercles in both sexes, apices of the femora, and the whole of the tibiæ and tarsi in the ♂, and the base of the tibiæ in the ♀, yellow.

Head and thorax dull, deeply and closely punctured. Antennæ in the ♂ with the scape flattened, deeply punctured, and much dilated, its posterior margin largely rounded at the base, then nearly straight to the apex, the apical margin forming with it a slightly obtuse angle; the anterior margin is largely rounded, especially at its juncture with the apical margin, and then approaches the base in a line convergent with the posterior margin; ♀ with the antennæ simple; the face rounder than in most of the species. Wings slightly dusky. Abdomen dull, and rather largely punctured in the ♂, somewhat shining and finely punctured in the ♀; 2nd segment in the ♂ with an impressed line near the base; tibiæ slightly hairy; ♂ genitalia with the stipites short and simple, but narrowly rounded at the apex; apical hairs short; sagittæ short and somewhat triangular. See pl. vii., fig. 11. Length 5—6 mm.

Rare. Hawley, Hants; Arundel; Hayling Island, on *Hieracium* and *Euphorbia*, &c., both sexes; Hastings.

3. *Prosopis communis*, Nyl.

Nyl., Not. Salls. Faun. Flor. Fenn., Förh. ii., p. 234; Smith, Cat. Brit. Hym., 2nd ed., p. 8 = *annulata*, Kirby, Förster, &c.

Black; ♂ with the clypeus down the centre only, or entirely, and the sides of the face, yellow; the yellow colour of the lateral spots somewhat encircling the antennal cavities at the base; anterior tibiæ in front, and posterior tibiæ and tarsi narrowly at the base, yellow; ♀ with a somewhat elongate triangular spot on each side of the face, and a narrow basal ring on the posterior tibiæ, yellow.

Head and thorax deeply punctured, and with a fine scattered pubescence; the surface between the punctures dull, and seen under a strong power to be finely rugose; puncturation of the scutellum sparser and larger than that of the mesothorax; post-scutellum subrugose; metathorax longitudinally rugose. Wings hyaline. Abdomen shining; basal segment impunctate or nearly so; following segments punctured, and in the ♂ with a very short black pubescence; no white pubescence at the apex of the 1st segment laterally in either sex; ♂ genitalia with the stipites widely rounded and somewhat dilated at the apex; sagittæ as long as the stipites or longer, narrow, converging at the apex. See pl. vii., fig. 9. Length 6—7 mm.

Hab. Generally distributed; generally found in bramble-flowers, and may be bred from the pierced stems.

4. *Prosopis signata*, Panz.

Panz., Faun. Germ. 53, 2; Smith, Cat. Brit. Hym., 2nd ed., p. 11.

The largest British species of the genus; black; ♂ with the face below the antennæ, ♀ generally with a spot on each side of the face near the eye, both sexes with a spot on each side of the prothorax, and a spot on each tubercle, yellow; extreme base of the tibiæ and tarsi in the ♂ yellow.

Head and thorax punctured with a fine short pubescence, the puncturation rather closer in the ♂ than in the ♀; head across the eyes wider than long; basal joint of the antennæ in the ♂ slightly curved and thickened at

the apex. Wings hyaline. Metathorax longitudinally rugose. Abdomen in the ♂ dull, strongly punctured, in the ♀ shining, finely punctured; both sexes with a line of white pubescence at the apex of the basal segment, and with a fine greyish pubescence on the sides and towards the apex of the abdomen; legs with fine short silvery hairs; ♂ genitalia with the stipites rounded at the apex; sagittæ shorter, diverging at the apex, and somewhat diagonally truncate. See pl. vii., fig. 7. Length 7—8 mm.

Hab. On flowers of bramble, mignonette, &c., July and August.

5. *Prosopis punctulatissima*, Smith.

Smith, Trans. Ent. Soc. Lond., iv., p. 33; Cat. Brit. Hym., 2nd ed., p. 10, ♀ only.

Very like the preceding, but rather smaller, and at once distinguishable by the long face, which is longer than wide across the eyes, and also by the white colour in the ♂ being carried up high above the antennæ on each side, and the spots in the ♀ being linear and bordering the eyes, extending from above the antennæ, not quite to the base of the clypeus; the vertex of the head also is longer, and the puncturation of the abdomen in the ♀ much larger and deeper, its surface dull; the rugosities of the metathorax much coarser and shining. Wings somewhat dusky. ♂ genitalia unusually large for the size of the species. Stipites apparently with a transverse impressed line about the middle; their apex subtruncate. Sagittæ very long, as long as the stipites. See pl. vii., fig. 12. Length 6 mm.

Hab. Birch Wood, Kent (F. Smith).

6. *Prosopis hyalinata*, Smith.

Smith, Trans. Ent. Soc. Lond., iv., p. 33; Cat. Brit. Hym., 2nd ed., p. 12.

Black, shining; face below the antennæ in the ♂ white, the white colour extending slightly above their insertion at each side: face in the ♀ with two triangular lateral spots. Antennæ in the ♂ ferruginous beneath; tubercles, base of all the tibiæ, the anterior tibiæ in front, and all

the tarsi in the ♂, also white; two spots on the prothorax, the tubercles, and the bases of all the tibiæ in the ♀, white.

Head and thorax very largely and coarsely punctured in the ♂, more finely in the ♀; face subelongate, very narrow between the eyes in the ♂, and covered in that sex with white hairs; both sexes with the space between the eye and the base of the mandibles unusually long, forming a distinct cheek, being nearly as long as the width of the base of the mandibles; scape of the antennæ in the ♂ short and slightly thickened; thorax, especially at the sides, with short pale hairs; 1st segment of the abdomen very shining, with a narrow line of silvery hairs on each side at the apex, very largely and remotely punctured in the ♂, finely, very shallowly, and rather remotely in the ♀, the punctures in the latter sex being sometimes scarcely observable; 2nd and following segments in the ♂ less strongly and more closely punctured than the 1st, in the ♀ extremely finely punctured; apical segment in both sexes with fine short grey hairs; the genital segments of the ♂ of quite a different form to those of any other British species; the stipites are very elongate and narrow, fringed with long hairs at the apex; the sagittæ are very short, and from beneath there extends a narrow clear testaceous process dilated at the apex into a wide spoon-shaped form; this latter is the ventral valve of the 8th abdominal segment (see pl. vii., fig. 10); legs with short silvery hairs. Length 6 mm.

Hab. Common in many places on flowers of bramble, &c., especially near the seaside.

7. *Prosopis confusa*, Nyl.

Nyl., (Revisio), Not. Salls. Faun. Flor. Fenn., Förh. ii., p. 232 = *punctulatissima*, Smith, Cat. Brit. Hym., 2nd ed., p. 10, ♂.

Very like the last in the general appearance of the ♀, but both sexes may be distinguished thus:—

♂ rather larger; mandibles with a white line; face wider, without long white hairs. Antennæ entirely black, or with a yellow line on the scape; thorax much more finely and closely punctured, the interstices dull; metathorax finely and longitudinally rugose; 1st segment of the abdomen finely and shallowly punctured,

with a very distinct line of silvery hairs on each side at the apex; the following segments finely punctured, each with a grey pubescence at the sides, almost forming an apical band; genitalia with the stipites short and fringed with long hairs at the apex; no projecting spoon-like process. (See pl. vii., fig. 8.)

♀ very like that of *hyalinata*, and probably in many collections mixed with it; but it has the antennæ entirely black, the thorax wider across the middle, and the apical segments irregularly and indefinitely punctured; whereas in *hyalinata* the puncturation is fine but distinct. Length 6—7 mm.

Hab. Flowers of brambles, &c.; Chobham, Hastings, Guildford, Reigate, &c.

8. *Prosopis brevicornis*, Nyl.

Nyl., (Suppl.), Not. Salls. Faun. Flor. Fenn., Förh. ii., p. 95 = *perforator*, Smith, Cat. Brit. Hym., 2nd ed., p. 13.

Rather smaller than either of the preceding. Black, with the flagellum of the antennæ more or less fulvous beneath; the face below the antennæ in the ♂, a spot on each side of the face in the ♀ bordering the eye (often absent), the anterior tibiæ in front in the ♂, and the posterior tibiæ at the base in both sexes, white; the white colour of the face extending above the antennæ at the side; basal joint of the intermediate and posterior tarsi white in the ♂.

Head and thorax deeply punctured. Vertex of the head squarer than in the other species, especially in the ♀. Scape of the antennæ in the ♂ very much swollen towards the apex, in form like an inverted cone; in the ♀ simple. Thorax dull, punctured like the head. Wings slightly dusky. Abdomen dull and closely punctured in the ♂, shining, very finely and remotely punctured in the ♀; both sexes with a very indistinct lateral line of silvery hairs at the apex of the basal segment. ♂ genitalia with the stipites simple and somewhat pointed, with long apical hairs; the sagittæ dentate on their inner margin near the base. (See pl. vii., fig. 6.) Length $4\frac{1}{2}$—$5\frac{1}{2}$ mm.

Hab. Hastings, Reigate, Southwold, Chobham, &c. Not rare. May be bred from bramble-stems.

9. *Prosopis pictipes*, Nyl.

Nyl., (Suppl.), Not. Salls. Faun. Flor. Fenn., Förh. ii., p. 95 = *varipes*, Smith, Cat. Brit. Hym., 2nd ed., p. 12.

Black; the antennæ fulvous beneath; face below the antennæ, white, and the basal joint of all the tarsi, and the base of all the tibiæ, yellow in the ♂; face in the ♀ with two yellow oval spots placed diagonally, the tubercles yellow, and the base of the posterior tibiæ white. Head and thorax punctured; the head in both sexes, and in the ♂ especially, much more closely than the thorax. Eyes in the ♂ converging much more rapidly to the clypeus than in most of the species, and the clypeus very narrow; ♀ with the face shorter and rounder than in most of the species. Scape of the antennæ simple in the ♂, not swollen or dilated. Abdomen dull in the ♂, and rather largely punctured, especially on the basal segment, the puncturation of the following segments closer and finer; in the ♀ the surface is more shining, and the puncturation is finer and remote. Genitalia of the ♂ with the stipites and sagittæ simple; the stipites with long apical hairs. (See pl. vii., fig. 5.) Length $4\frac{1}{2}$—$5\frac{1}{2}$ mm.

Hab. Hayling Island; Reigate; Chobham.

Easily distinguished from *brevicornis* by the simple scape of the ♂ and the diagonal facial spots of the ♀, and yellow tubercles.

ACUTILINGUES.

1st joint of the labial palpi not many times longer than apical	Div. I.
1st joint of labial palpi many times longer than apical ..	Div. II.

Division I.

(8)	1. Front wings with three submarginal cells.	
(7)	2. Apical joint of antennæ not obliquely truncate.	
(6)	3. 2nd and 3rd joints of antennæ subequal.	
(5)	4. Tongue lanceolate, sides rounded; abdomen very shining, red at the base	*Sphecodes.*
(4)	5. Tongue acute, sides sinuate; abdomen rarely red, and then only in the ♂	*Halictus.*
(3)	6. 2nd joint of antennæ not half so long as the 3rd	*Andrena.*
(2)	7. Apical joint of the antennæ obliquely truncate ..	*Cilissa.*
(1)	8. Front wings with two submarginal cells.	
(10)	9. Posterior tibiæ and basal joint of tarsi not dilated	*Dasypoda.*
(9)	10. Posterior tibiæ and basal joint of tarsi dilated ..	*Macropis.*

Sphecodes, *Latr.*

Latr., Hist. Nat., xiii., p. 368. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd ed., pl. vi.

Tongue acute, its sides rounded; paraglossæ small, not acute; labial palpi 4-jointed; maxillary palpi 6-jointed; anterior wings with three submarginal cells; ♀ with the posterior tibiæ only sparsely clothed with hairs. Abdomen polished and shining in both sexes, and more or less red.

This genus is closely allied to *Halictus*, but the shining red body will, as a rule, distinguish any of its species at once. There are some red-bodied species of *Halictus*, but they have all the abdomen more or less clothed with hairs, or banded with hairs at the apex of the segments.

All the species are very closely allied, and some authors have considered them all as varieties of one species; but when the ♂ genitalia are examined and the apical dorsal valves of the females, I think little doubt can be felt as to their distinctness.

(4) 1. Posterior wings with seven to ten hooks. Antennæ in ♂ long; 3rd joint not one-fourth the length of the 4th.

(3) 2. Vertex of head much narrowed behind the eyes. ♂; genitalia with the squama produced into a membranous wing on its inner margin, and terminating in two unequal, densely hairy, processes, of which the upper is much the longer, and is produced and widened at the apex. ♀; apical dorsal valve narrow and linear .. .. .. *gibbus.*

(2) 3. Vertex in both sexes usually subquadrate, though very variable in this respect. Squama of ♂ genitalia not winged, and ending in two subequal processes, sparingly clothed with short hairs. ♀; apical dorsal valve wide and flat .. .. *subquadratus.*

(1) 4. Posterior wings with five to six hooks. Antennæ in ♂ short; 3rd joint much more than one-fourth the length of the 4th.

(10) 5. Stipites of the ♂ genitalia not grooved. Antennæ with the joints much produced and rounded in front; ♀ with the puncturation of the thorax large and close; 3rd segment of abdomen without a lateral black spot or fovea.

(9) 6. Surface of genitalia in ♂ longitudinally striate; 2nd submarginal cell longer than wide in both sexes.

(8) 7. Larger; ♂ genitalia with the sagittæ very narrow, and fringed with short hairs; the squama membranous and somewhat quadrate, with a thickened semi-lunate central region; ♀ with the apical dorsal valve wide, slightly reflexed, and shining at the edges .. .. *pilifrons.*

(7) 8. Smaller; ♂ genitalia with the sagittæ much widened at the base; the squama produced into two processes, of which the lower one is rather the longer; ♀ apical dorsal valve narrower, dull, and with an impression running parallel to its edge round its apex .. .. *similis.*

(6) 9. Surface of genitalia in ♂ finely rugose, not longitudinally striate; 2nd submarginal cell in both sexes, on its lower margin, as wide as long, narrowed above .. .. *puncticeps.*

(5) 10. Punctures of thorax fine and distant; genitalia of ♂ with the stipites widely grooved; ♀ with the 3rd segment of the abdomen generally with a small spot or fovea on each side near the base; apical dorsal valve narrow .. .. .. *ephippium.*

1. *Sphecodes gibbus*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 571; Smith, Cat. Brit. Hym., 2nd ed., p. 17.

Black, shining; thorax largely and remotely punctured; abdomen red, with the base and apex black; wings brown, 2nd submarginal cell narrow.

♂. Head dull, rugosely punctured; face in front of the antennæ clothed with silvery white hairs. Antennæ with the 2nd and 3rd joints transverse and subequal in length; the 4th very much longer, more than twice as long as the other two together; joints of the flagellum, especially near its apex, with a narrow band of pale fine hairs; vertex very slightly produced behind the eyes, clothed with greyish hairs; mesothorax sparingly clothed with very short greyish hairs, shining, and very largely punctured; post-scutellum and metathorax rugose, the basal area of the latter longitudinally rugose. Abdomen elongate, shining, remotely punctured, testaceous-red; the 1st segment, except at the apex, occasionally a band on the 2nd and 3rd, and the whole of the 4th and following segments, black; beneath shining, finely punctured; for genitalia see pl. viii., fig. 3; legs black; extreme apex of the tarsi piceous.

♀. Wider than the ♂; antennæ short; face clothed with grey hairs; mesothorax more shining than in the ♂, very largely and remotely punctured. Abdomen ovate,

punctured and coloured as in the ♂, but with only the extreme base of the 1st segment and the three apical segments black; 5th segment clothed with a dense fringe of thick, black, curved hairs at the apex; 6th segment with the central naked portion linear and narrow; beneath shining, punctured, sparsely clothed with brown hairs; 6th segment rather raised at the apex, and with an apical bristly tuft of brown hairs; legs somewhat piceous, clothed with brown hairs, and those at the base of the posterior tibiæ whitish. Length 8—10 mm.

Hab. Common in summer; the ♂ appears in July and August.

2. *Sphecodes subquadratus*, Smith.

Smith, Zool., vol. iii., p. 1014, fig. 5; Cat. Brit. Hym., 2nd ed., p. 19.

Very like the preceding, of the same size, and with the same sparse puncturation of the thorax, but as a rule with the vertex of the head in both sexes incrassate.

The ♂ differs further from *gibbus* in having the wings clearer, and the genitalia of quite a different form; (see pl. viii., fig. 2). The ♀ in having the wings clearer, the apex of the 5th segment with paler brown hairs, not curved as in *gibbus*, and the apical dorsal valve with the central glabrous portion wide and flat; apical ventral valve simply hairy, without the bristly tuft of hairs observable in the preceding.

Hab. Not quite so common as *gibbus*, but often occurring with it, and the incrassate vertex of the head generally giving it a very distinct appearance.

3. *Sphecodes pilifrons*, Thoms.

Thoms., Opusc. Ent., i., p. 99 = *rufiventris*, Smith (nec Wesm.), Cat. Brit. Hym., 2nd ed., p. 18.

Black. Abdomen with the apex of the 1st segment, the 2nd, and the base of the 3rd in the ♂, red; in the ♀ with the 4th and 5th. Thorax closely punctured. Wings slightly dusky; posterior wings with five to six hooks. Like the two preceding in colour, but easily distinguished by the closely punctured dull mesothorax,

and the number of alar hooks (five to six); the ♂ differs also essentially in the short antennæ, which hardly reach to the base of the scutellum, the much denser grey pubescence of the head and thorax, the rather less elongate abdomen, and the form of the genitalia (see pl. viii., fig. 5).

Hab. A common species, occurring often with the two preceding.

4. *Sphecodes similis*, Wesm.

Wesm., Bull. Acad. Brux. 1835, vol. ii., p. 279.

This species is very closely allied to *pilifrons*, but it is smaller; the ♂ has the joints of the antennæ more swollen in front, and the antennæ altogether rather thicker, the thorax less pubescent, the abdomen shorter and oval, and generally with a black spot on each of the segments, sometimes entirely black, and the genitalia differently shaped, as shown in pl. viii., fig. 4.

The ♀ only differs from *pilifrons* in its smaller size and its narrower dorsal apical valve, the margins of which are more reflexed, and have an impressed line within the reflexion. Length 6—8 mm.

Hab. Reigate; Chobham; Southwold; Worthing; and probably common generally, but mixed with the preceding.

5. *Sphecodes punticeps*, Thoms.

Thoms., Opusc. Ent., i., p. 99; Hym. Scand. ii., p. 157.

Of this species only the ♂ has occurred, so far as I know, in England, which may be distinguished from its allies by the wider 2nd submarginal cell of the upper wings, which is slightly narrowed above, and by the fine reticulation of the surface of the genitalia, which in the other British species are longitudinally strigose; (see pl. viii., fig. 1); the wings also are less dusky than in most of the species. The ♀ should (according to Thomson) have the wings as in the ♂, and the dorsal apical valve narrow. Length, ♂ 6 mm.

Hab. I have one specimen taken at Chobham, and another from Bournemouth.

6. *Sphecodes ephippium*, Linn.

Linn., Syst. Nat., ed. xii., p. 944; Smith, Cat. Brit. Hym., 2nd ed., p. 20.

One of the smallest species of the genus, but often confounded with small examples of some of the preceding.

The ♂ may be recognised by its antennæ, of which the joints are scarcely produced and swollen in front at all, and the 4th joint is scarcely longer than the 5th, and about equal to the 2nd and 3rd together; also the joints in front have the pubescence extending almost to their apex; another well-marked character is the widely grooved stipites of the genitalia; (see pl. viii., fig. 6). The elongate abdomen of this little species is often banded with black on all the segments.

The ♀ may be recognised by its shining, finely punctured, thorax, the narrow apical dorsal valve of the abdomen, and the piceous tarsi and pale front to the anterior tibiæ, and generally by the small black fovea at the base of the 3rd segment of the abdomen on each side. Length 5—6 mm.

Hab. Very common, and generally distributed.

Halictus, *Latr.*

Latr., Hist. Nat., xiii., p. 364. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd ed., pl. vi.

Tongue acute, its sides emarginate; paraglossæ subacute; labial palpi 4-jointed; maxillary palpi 6-jointed. Wings with three submarginal cells. Antennæ in the males long; the abdomen elongate and cylindrical, except in one or two species; apical ventral segment not produced as in *Andrena*. Antennæ in the females short; the abdomen ovate; 5th segment with a narrow central dorsal rima; 6th dorsal segment almost hidden.

The genitalia of the males afford excellent specific characters.

The head and thorax in nearly all the species of this genus are clothed with longish hairs; the abdomen is generally banded or spotted at the sides of the segments with white pubescence. The chief specific

characters seem to lie in the shape of the face and metathorax, and the sculpture and puncturation of the various portions of the insect; but it requires great care and very minute examination in some cases to refer an individual with certainty to its proper species, especially in the group of *minutus*, *nitidiusculus*, &c.

This is amongst the most difficult of our British genera of Aculeates to tabulate, and the tables I have prepared are far from satisfactory; still I hope they will be of some use as an aid to distinguish the species. I have divided the genus into six divisions:—

(2) 1. White pilose bands of the abdomen situated on the apical margins of the segments .. .. .. Div. I.

(1) 2. White pilose bands of the abdomen, when present, situated on the basal margins of the segments.

(10) 3. Species not small and æneous.

(5) 4. Large or medium-sized species; abdomen deep black, with conspicuous pubescent spots or bands on the 2nd, 3rd, and sometimes 4th segments; posterior margins of segments not testaceous .. Div. II.

(4) 5. Large or medium-sized species, with pale apical margins to the segments; or small species, with scarcely any indication of the lateral spots, or with the body entirely black.

(7) 6. Hind margins of the segments rather widely testaceous; ♂ with the body smooth and glabrous beneath; ♀ with the brow of the metathorax sharply truncate, or with a more or less raised line at the sides or very rugose, the brow not smoother than the rest .. .. Div. III.

(6) 7. ♂ with the segments of the body fringed beneath; metathorax in the ♀ rugose at the base, but smoother towards the brow, which is more or less rounded, and has no signs of a raised lateral line.

(9) 8. Surface of thorax very smooth and polished, puncturation remote or very coarse and rugose; metathorax radiately rugose. In one species, *punctifollis*, although the centres of the punctures are remote, the actual punctures are so large that their edges are pretty close together .. .. Div. IV.

(8) 9. Surface of thorax rarely polished, but under a strong power seen to be finely rugose between the punctures; puncturation fine and close .. .. Div. V.

(3) 10. Species small and æneous, at least as regards the thorax .. .. Div. VI.

Division I.

(4) 1. White bands of the abdomen interrupted only on the upper segments.

(3) 2. ♂, mandibles not dilated; ♀ with yellow posterior tibiæ .. .. *rubicundus.*

(2) 3. ♂, mandibles dilated; ♀, posterior tibiæ black .. 4-*cinctus.*

(1) 4, Segments of abdomen with only a spot on each side *maculatus.*

1. *Halictus rubicundus*, Christ.

Christ, Hym., p. 190, pl. xvi., fig. 10; Smith, Cat. Brit. Hym., 2nd ed., p. 79.

Black; head and thorax covered with brown hairs (fading to grey in old specimens); segments of the abdomen with white apical fringes; posterior tibiæ and tarsi clear testaceous in both sexes.

♂ with the head finely and closely punctured; the clypeus and labrum flavous. Antennæ reaching to about the scutellum, slightly brownish on their under side. Thorax punctured as the head; metathorax finely and longitudinally rugose at its extreme base, rugosely punctured on the rest of its surface. Wings hyaline, scarcely darker at the apex. Abdomen elongate, very finely punctured, the puncturation somewhat rugose and irregular; the 1st, 2nd, and 3rd segments each with a narrow apical band of white hairs, the 1st and 2nd interrupted in the middle; surface of all the segments clothed with scattered pale hairs; beneath with the segments depressed; the 4th and 5th emarginate, especially the 5th; (for genitalia see pl. viii., fig. 8). All the femora black; the tibiæ and tarsi flavous, with a dark spot on the inner side of the former.

♀ very like the ♂ in coloration, but wider and more massive. Antennæ short; clypeus black; head and thorax closely punctured, densely clothed with brown hairs; metathorax rugosely punctured. Abdomen finely punctured, banded as in the ♂, but with an entire band on the 4th segment; 5th segment densely covered with golden hairs on each side of the central ridge. Legs covered with golden hairs. Anterior tarsi only pale; intermediate tibiæ at the apex and tarsi, and the whole of the posterior tibiæ and tarsi, clear testaceous. Length 10 mm.

A very distinct species, and the ♀ known at once from

the others which have apically banded segments, by the clear yellow tibiæ; the ♂ by its simple mandibles, and the bands, not spots, at the sides of the segments.

Hab. Common in many sandy places.

2. *Halictus quadricinctus*, Fab.

Fab., Syst. Piez., p. 319; Smith, Cat. Brit. Hym., 2nd ed., p. 80.

Black; head and thorax rather densely clothed with hairs in ♂, sparingly clothed with dull brown hairs in the ♀; segments of the abdomen with white apical bands. Wings hyaline.

♂. Head elongate; clypeus much produced, with a whitish yellow transverse spot at the apex; mandibles, looked at sideways, dilated at the base. Antennæ long, reaching to beyond the thorax; surface of the head closely punctured. Thorax punctured as the head, rather thickly clothed with greyish brown hairs; metathorax finely rugose. Abdomen elongate, subclavate, punctured, and clothed with very short erect hairs; the first four segments each with an apical band of white pubescence, that of the 1st segment largely interrupted in the middle; beneath flat, almost glabrous; 4th and 5th segments emarginate, and fringed at the apex with short golden hairs; (for genitalia see pl. viii., fig. 7). Legs covered with short hairs. Anterior and intermediate femora in front, and all the tibiæ and tarsi, testaceous; posterior tibiæ with a black spot on each side.

♀. Something like that of *rubicundus*, but with all the legs black, the hairs only being golden, and the tarsi more or less testaceous. Head and thorax punctured; metathorax finely rugose. Abdomen scarcely shining, closely and evenly punctured all over; first four segments each with a white apical band of pubescence; those of the 1st and 2nd segments interrupted; 5th segment with pale golden hairs on each side of the central rima; beneath densely clothed with long golden hairs. Length 9 mm.

Hab. Very rare. Sir Sidney Saunders has taken the ♀ near Eastbourne, and both sexes near Brighton in August; and I am indebted to him for the specimens from which I have described. Mr. Dale took the ♀ in the Isle of Portland, and Mr. Kirby quotes the London

district and "Blakenham Parvum" as localities for it. It is a common continental species.

3. *Halictus maculatus*, Smith.

Smith, Zool. vi., p. 2172, ♀; Cat. Brit. Hym., 2nd ed., p. 86.

Black; ♂ dull, ♀ shining; first four segments each with a white pilose spot on each side at the apex. Vertex of the head incrassate in both sexes. Wings smoky brown.

♂ rugosely punctured; head and thorax clothed with ochreous-brown hairs; face densely covered with whitish hairs. Clypeus with a white spot at the apex; mandibles testaceous, except at the base, not dilated. Antennæ reaching to about the scutellum, brown beneath; vertex flat and produced considerably behind the eyes. Thorax punctured like the head; dorsal area of the metathorax finely rugose; the rest of the metathorax punctured. Abdomen closely punctured, the punctures largest on the basal segment, and becoming finer on the apical segments. Each segment depressed at the base and apex, and bearing a short narrow line of white silvery hairs on each side along the apical margin of the 1st, 2nd, 3rd, and 4th; beneath flat, 4th and 5th segments not emarginate at the apex; surface punctured and almost naked; (for genitalia see pl. viii., fig. 12). Legs covered with short silvery hairs; front tibiæ anteriorly, and intermediate and posterior tibiæ at the base and apex, and all the tarsi, yellow.

♀. Head closely punctured, wider than the thorax; vertex considerably produced behind the eyes; face sparingly clothed with golden hairs. Thorax more remotely punctured than the head, shining, with scattered golden hairs; post-scutellum very finely and closely punctured; metathorax finely rugose. Abdomen shining, finely punctured, narrower and more parallel-sided than usual for a ♀ of this genus; each of the first four segments with a lateral spot of silvery hairs at the apex; 5th segment with pale golden hairs on each side of the centre; beneath and legs densely clothed with golden hairs. Length 9 mm.

Hab. Weybridge; Hastings, August, 1879; Blackwater. These are the only localities recorded, and in

each case a single ♀ was captured. I have described the ♂ from a continental specimen.

Division II.

(2)	1.	Tibiæ pale in both sexes	*xanthopus.*
(1)	2.	Tibiæ dark in both sexes.	
(12)	3.	Head and thorax without a greenish tinge.	
(5)	4.	Pubescence of thorax ashy grey	6-*notatus.*
(4)	5.	Pubescence of thorax more or less brown.	
(7)	6.	♂; abdomen beneath without long hairs; abdominal fasciæ of ♀ more or less fulvous ..	*lævigatus.*
(6)	7.	Abdomen of ♂ clothed with long hairs beneath; abdominal fasciæ of ♀ white.	
(11)	8.	Tarsi of ♂ entirely black, or white above only on the basal joint; abdominal bands in ♀ entire, or nearly so.	
(10)	9.	Tarsi of ♂ with the basal joint pale; basal segment of body in ♀ closely and evenly punctured all over	*leucozonius.*
(9)	10.	Tarsi of ♂ entirely black; basal segment of body in ♀ shining and somewhat remotely punctured, especially about the middle	*zonulus.*
(8)	11.	Tarsi of ♂ entirely yellowish; abdominal segments of ♀ with only a white spot on each side	4-*notatus.*
(3)	12.	Head and thorax more or less greenish	*prasinus.*

4. *Halictus xanthopus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 79; Smith, Cat. Brit. Hym., 2nd ed., p. 81.

Black; head and thorax covered with bright brown hairs; wings slightly brownish; 2nd, 3rd, and 4th segments of the abdomen with a white basal band; tibiæ testaceous in both sexes.

♂. Head punctured; face clothed with long pale hairs. Apex of the clypeus with a pale transverse spot. Antennæ long, reaching to beyond the scutellum. Thorax rather more largely punctured than the head; metathorax finely rugose. Abdomen wide, obovate, shining, irregularly punctured on the basal segment, finely and closely punctured on the rest; basal segment clothed with long hairs, the rest having, besides the basal white bands, a few scattered golden hairs; beneath clothed with pale hairs; 5th segment with the apical margin emarginate in the centre; (for genitalia see pl. viii., fig. 13).

Legs densely clothed with pale hairs; all the tarsi and the posterior femora testaceous.

♀. Very like the ♂, but without the long antennæ. Head closely punctured, not so wide as the thorax; face sparingly covered with brown hairs. Thorax closely punctured, densely covered, especially at the sides, with bright brown hairs; metathorax finely rugose; dorsal area bounded posteriorly by a sharply raised line. Abdomen shining; 1st segment irregularly punctured at the base, closely and finely at the apex, clothed on its basal half and sides with brown hairs; other segments finely punctured; 2nd, 3rd, and 4th bearing a white basal band of pubescence; 5th segment with bright golden hairs on each side of the rather wide piceous central rima; beneath densely clothed with golden brown hairs. Legs covered with golden hairs; posterior tibiæ and tarsi testaceous; inner spur of each posterior tibia with several blunt teeth along its edge. Length 12—13 mm.

Hab. Brighton, Hastings, Ventnor, Arundel, Littlehampton, Southend, and near Deal. A local species, but occasionally plentiful, and very distinct from any other British *Halictus*.

5. *Halictus leucozonius*, Schrank.

Schrank., Enum. Ins. Austr., p. 406, n. 819; Smith, Cat. Brit. Hym., 2nd ed., p. 83.

Black; head and thorax sparsely clothed with grey-brown hairs; ♂ with the basal joint of the intermediate and posterior tarsi, except at the extreme apex, white; ♀ with the basal segment of the abdomen dull, finely and evenly punctured all over; 2nd, 3rd, and 4th segments with white basal bands.

♂. Head finely and closely punctured, about as long as wide across the eyes; face clothed with white pubescence. Clypeus with a white apical spot. Antennæ reaching to about the scutellum. Thorax somewhat rugosely punctured, clothed with brownish grey hairs; metathorax truncate posteriorly, its basal area triangular and longitudinally rugose; metathorax clathrately rugose beyond. Wings hyaline. Abdomen elongate-oval, finely but not very closely punctured, and clothed sparingly with short erect white hairs; the 1st segment on its basal half rather more densely covered with longer hairs; 2nd,

3rd, and 4th segments with a basal band of white pubescence, widening at the sides; beneath densely clothed with long white hairs; (for genitalia see pl. viii., fig. 10). Legs covered with short white hairs; base of posterior tibiæ, and the basal joint of the intermediate and posterior tarsi, white, except the extreme apex of the latter; apical joint of all the tarsi brown.

♀. Considerably larger than the ♂; face nearly round; head finely punctured. Thorax closely punctured, the puncturation closer in some specimens than in others; scutellum densely hairy; metathorax as in the ♂. Wings slightly dusky. Abdomen ovate; the basal segment dull, finely punctured all over; 2nd, 3rd, and 4th segments each with a white basal band; 5th segment on each side of the central rima, and all the segments beneath and the legs, densely clothed with golden hairs. Length 8—10 mm.

Hab. Very common and generally distributed.

6. *Halictus zonulus*, Smith.

Smith, Zool. vi., p. 2171; Cat. Brit. Hym., 2nd ed., p. 84.

Black; head and thorax covered with brown hairs; ♂ with the legs entirely black; ♀ with the 1st segment of the abdomen shining, sparsely punctured about its disk; ♂ and ♀ nearly equal in size; 2nd, 3rd, and 4th segments of the abdomen each with a white basal band.

♂ differs from *leucozonius* by its larger broader form, its large thick head and round face, its wide abdomen, almost as wide as that of the ♀, the truncate and somewhat bilobed anal segment, and the entirely black legs; (for genitalia see pl. viii., fig. 9).

♀ differs by its more shining body and irregularly punctured basal segment, which is almost impunctate and highly polished in the middle, the curved, not angular, margin of the metathoracic area, and the paler stigma of the wings. Length 8—9 mm.

Hab. Not so common as the preceding, but generally distributed.

7. *Halictus quadrinotatus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 79; Smith, Cat. Brit. Hym., 2nd ed., p. 85.

Very like a small *leucozonius*, but known at once by the following characters:—

The ♂ has the metathorax more finely rugose, and its basal area not bounded at the apex by a raised angulated ridge; the clypeus much less produced and wider; the tarsi entirely pale, only the apical joints slightly piceous; (for genitalia see pl. viii., fig. 11).

♀ with the face almost broader than long, the post-scutellum not villose; the metathorax rounded posteriorly. Abdomen shining and irregularly punctured; basal segment with only a very few short hairs; 2nd and 3rd segments each with two white lateral basal spots; the 4th segment covered with grey hairs; the 5th with golden hairs on each side of the central rima. Length 7—8 mm.

Hab. Generally distributed and not rare; Chobham, Hayling Island, Tunbridge Wells, Reigate, &c.

8. *Halictus lævigatus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 75; Smith, Cat. Brit. Hym., 2nd ed., p. 90, ♂ nec ♀; ♂ = *lugubris*, Kirby, Smith, *l. c.*, p. 83.

Head and thorax covered with bright brown hairs. Abdomen very shining, remotely punctured; 2nd and 3rd segments with a white basal band in the ♂; 2nd, 3rd, and 4th with an ochreous basal band in the ♀, more or less interrupted in the centre.

♂. Black, shining; head rugosely punctured, wider across the eyes than long; clypeus not spotted; face below the antennæ covered with white, somewhat adpressed, hairs; above them with brown erect hairs. Antennæ reaching to just beyond the metathorax. Thorax strongly and rather largely punctured, covered with brown hairs; metathorax shining, sharply truncate posteriorly, its basal area subtriangular, deeply and longitudinally rugose, beyond the basal area largely clathrate. Abdomen elongate, shining, deep black, remotely punctured; 1st segment with erect hairs on its basal portion; 2nd and 3rd segments with a band of

white hairs at the base, more or less interrupted in the middle; 5th and 6th segments clothed with scattered hairs, the 5th with a slight indication of a basal band; beneath nearly flat and almost glabrous, 4th and 5th segments slightly emarginate posteriorly, 5th depressed, with a slight dorsal line; legs, with the tarsi and extreme base of posterior tibiæ, pale, three apical joints of posterior tarsi fuscous; (for genitalia see pl. ix., fig 18).

♀. Head and thorax covered with bright chestnut-brown hairs; head closely punctured. Thorax remotely punctured on the disk; metathorax shining, looked at from in front sharply truncate posteriorly, its basal area longitudinally rugose, bounded behind by a curved line. Abdomen deep black, very shining; 1st segment clothed with brown hairs at the base, remotely punctured; 2nd, 3rd, and 4th segments rather more closely punctured, each with an ochreous basal band of pubescence, and clothed beyond it with scattered brown hairs; 5th segment with golden brown hairs on each side of the rima; beneath and legs densely clothed with brown hairs. Length 8—9 mm.

Hab. Not common. Reigate; Guildford; Shipley, near Horsham; Greenwich; Charlton; Ventnor; Bristol; Scotland.

♀ quite distinct from any other of its group by the bright brown head and thorax, and the ochreous bands of the abdomen. The ♂ by its elongate shining abdomen, nearly glabrous beneath, and its black clypeus.

9. *Halictus sexnotatus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 82, pl. xv., figs. 7, 8; Smith, Cat. Brit. Hym., 2nd ed., p. 84.

Black; head and thorax covered with ashy grey hairs. Abdomen shining; 2nd, 3rd, and 4th segments with a basal spot, on each side, of snow-white pubescence; legs of the ♂ entirely black. Wings infuscate.

♂. Head and thorax finely and closely punctured; face about as long as wide across the eyes. Clypeus rather narrow, white at the apex. Antennæ reaching to the middle of the metathorax; mesothorax densely and very finely punctured, the punctures rather farther apart on the disk; post-scutellum densely villose; metathorax rounded posteriorly, finely rugose on its basal area,

with a slightly raised dorsal line. Abdomen subelongate, finely punctured, the puncturation of the basal segment rather more remote than that of the following ones; segments beneath not depressed, clothed with somewhat adpressed hairs; (for genitalia see pl. viii., fig. 14). Legs clothed with grey hairs.

♀. Only differing from the ♂ in the wider shape, shorter antennæ, black clypeus, and rather more shining abdomen, which is densely hairy beneath. Length 10—12 mm.

Hab. Rare. Chobham, Weybridge, Barham, &c. Known from all the British species by its ashy grey thorax and large size.

10. *Halictus prasinus*, Smith.

Smith, Zool. vi., p. 2169, 1848; Cat. Brit. Hym., 2nd ed., p. 92 = *hæmorrhoidalis*, Schk.

Black; face elongate in both sexes, much narrowed in front; clypeus much produced; apical segment of the abdomen in the ♂ red; head and thorax in the ♀ with a greenish tinge.

♂. Head and thorax black, with a very slight greenish tinge, finely and closely punctured; face elongate, covered with greyish white hairs; clypeus considerably produced, truncate at the apex, and sometimes white across its apical half. Antennæ reaching to beyond the scutellum. Thorax covered with short greyish hairs; metathorax finely and longitudinally rugose, its brow semicircularly rounded. Abdomen slightly shining, rather finely and clearly punctured; 1st segment covered at the sides with whitish pubescence; 2nd, 3rd, and 4th segments with a lateral spot of white pubescence; 5th segment with an almost entire basal band; 7th segment red; beneath, 4th segment emarginate, but with a scarcely observable fringe, 5th segment emarginate, with a long fringe, apex of 6th segment much rounded. Genitalia with the sagittæ produced above the surface of the stipites into two curved knife-like edges; (see pl. ix., fig. 9). Tarsi, and sometimes the base and apex of tibiæ, pale.

♀. Larger and wider than the ♂. Head and thorax much as in that sex, except the black apex to the clypeus and the short antennæ; green metallic tinge rather more

distinct, and the puncturation rather closer and finer. Abdomen black, with perhaps a slight æneous tinge; basal segment shining, distinctly punctured, with an impunctate, somewhat raised, polished space on each side of the centre; base of the segment, on each side, covered with white pruinose pubescence; 2nd and 3rd segments with a white basal band of the same, and the 4th entirely covered with it; 5th covered with golden hairs, except the central rima; 6th with a rather narrow, somewhat truncate, dorsal valve; beneath with the segments largely punctured at the apex, and with long apical fringes. Legs black; scopa of posterior legs golden grey. Length 8—10 mm.

Hab. Chobham; Bournemouth; Poole; and Christchurch, Hants; Moffat, Scotland.

Division III.

(10)	1. Abdomen more or less punctured.	
(7)	2. 1st segment of abdomen scarcely punctured, the punctures scattered or fine and remote.	
(6)	3. Large or medium-sized species, 4 to 5 lines. Thorax very closely punctured.	
(5)	4. Larger; metathorax, looked at from above, posteriorly sharply truncate, its angles prominent and with their margins considerably raised; ♀ with the abdomen more shining; 2nd and following segments scarcely punctured; ♂ with the thorax more hairy, and the legs darker ..	*cylindricus.*
(4)	5. Smaller; metathorax not so sharply truncate; angles not prominent and scarcely margined; ♀ with the abdomen very closely and finely punctured on the 2nd and following segments; ♂ with the thorax less hairy, and the legs lighter	*albipes.*
(3)	6. Small species, 2¾—3 lines. Thorax rather remotely punctured	*pauxillus.*
(2)	7. 1st segment of body very finely and closely punctured.	
(9)	8. Larger; metathorax in ♀ bounded posteriorly by a well-defined sharp ridge; basal segment of abdomen in both sexes exceedingly finely and closely punctured nearly up to its base ..	*malachurus.*
(8)	9. Smaller; in ♀ metathorax bounded by a very indefinite ridge; basal segment of abdomen in both sexes exceedingly finely punctured, but not so very closely, the puncturation only just extending on to the basal half	*longulus.*
(1)	10. Abdomen impunctate	*subfasciatus.*

11. *Halictus cylindricus*, Fab.

Fab., Ent. Syst. ii., p. 302; Smith, Cat. Brit. Hym., 2nd ed., p. 87.

Black; head and thorax sparsely clothed with brown hairs; metathorax, viewed from in front, sharply truncate, its angles slightly reflexed. Abdomen in the ♂ elongate, generally more or less red; in the ♀ oval. Apical margins of the segments in both sexes widely pale; the 2nd, 3rd, and 4th segments in the ♂ and the 2nd and 3rd in the ♀ with a lateral basal spot of white pubescence.

♂. Head and thorax closely punctured; face elongate; eyes converging considerably towards the clypeus; mandibles divided from the eyes by a narrow cheek. Clypeus produced, sharply truncate in front, with a large pale spot at the apex; face below the antennæ covered with white hairs. Antennæ reaching to about the end of the metathorax. Thorax with the puncturation more distant than that of the head. Wings almost clear; nervures brown; metathorax, viewed from in front, sharply truncate behind, its apical margin reflexed near the lateral angles; viewed from above, with a somewhat triangular clathrate basal area. Abdomen shining, elongate, shallowly punctured; 1st, 2nd, and 3rd segments often more or less red at the sides and apex. Apical margins testaceous: 2nd, 3rd, 4th, and often 5th, segments at the base with a lateral white pubescent spot. Abdomen above with a few scattered brown hairs, beneath glabrous, nearly flat; (for genitalia see pl. ix., fig. 1). Legs black; the base and apex of the tibiæ and the tarsi pale; the apical joints of the latter brownish.

♀. Head and thorax finely and closely punctured, clothed with brown hairs; inner margins of the eyes converging slightly towards the clypeus; metathorax as in the ♂, but with its basal area semicircular. Abdomen oval, slightly wider than the thorax; basal segment very shining, clothed with scattered brown hairs at the base and sides, but glabrous on the disk and apex; the surface sparsely and very shallowly punctured, the following segments duller and clothed with a short brown pubescence, forming a distinct band at the apex; the 2nd and 3rd segments with a white lateral pubescent streak at the base; 5th densely clothed with golden brown hairs.

Beneath with the apical portions of the segments clothed with long hairs. Legs black, covered with golden brown hairs; the tarsi more or less testaceous. Length 8—10 mm.

Hab. Common and generally distributed.

12. *Halictus albipes*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 71; Smith, Cat. Brit. Hym., 2nd ed., p. 89.

This species is so closely allied to the last as to be distinguishable only by careful examination.

It is generally smaller, and the pubescence of the abdomen and legs is paler; in the ♂ the face is much longer, the metathorax longer, much less rugose, and without the sharp reflexed truncature of that of *cylindricus*; the tarsi are entirely pale; (for genitalia see pl. ix., fig. 8).

The ♀ is more difficult to recognise; the face is only slightly longer, but the metathorax, looked at from in front, is distinctly longer, its basal area less regularly rounded, and the truncature below it narrower, less distinct, and with the lateral angles not reflexed. Length 7—9 mm.

Hab. Common and generally distributed, often occurring with *cylindricus*.

13. *Halictus malachurus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 67; Smith, Cat. Brit. Hym., 2nd ed., p. 88.

♂. Black. Head finely punctured. Antennæ pale beneath; face shorter than in either of the preceding; apex of the clypeus, labrum, and mandibles yellow; below the antennæ covered with white hairs, above them with scattered greyish brown hairs. Thorax not quite so finely punctured as the head, but more closely and evenly than in *cylindricus*; metathorax not truncate, dull, longitudinally rugose at the base, the rugosities gradually vanishing towards the apex; basal area not defined. Wings with their nervures pale. Abdomen dull, closely and evenly punctured all over, the 1st segment hardly less closely than the others; the apex of each segment narrowly testaceous, and all but the 1st clothed with a very short greyish pubescence; the 2nd and 3rd with an

ill-defined lateral spot of white pubescence at the base; beneath shining; (for genitalia see pl. ix., fig. 4). Legs: femora black, with their extreme apex pale; tibiæ pale yellow at the base and apex and along their upper margin; tarsi pale yellow; apical joint brown.

♀. Closely resembling *cylindricus* and *albipes*, but known at once by the close even puncturation of the 1st abdominal segment, and its greater width at the base; also by its metathorax, which, as described in the ♂, is without the well-defined basal area observable in those species. Unlike the ♂, however, the apex of the metathorax, viewed from in front, is truncate or slightly raised at the sides, but not sharply angulated at the sides as in *cylindricus*; the abdomen also is more densely clothed with pubescence, and the sides of the metathorax beneath far less rugose. Length 7—9 mm.

Hab. Not a common species. I have taken both sexes at Chobham, and the ♀ at Wandsworth; I have seen males from Hastings, and the late F. Smith took the ♀ at Cromer.

At Chobham, in April, 1878, there was a colony of this species burrowing in the path of a garden; the females flew about till nearly 3.30 p.m., and then commenced throwing up fresh mould from their burrows, but I failed to ascertain how late they continued their operations.

14. *Halictus longulus*, Smith.

Smith, Cat. Brit. Hym., p. 39 (1855); Cat. Brit. Hym., 2nd ed., p. 99.

♀. So like the preceding that it might easily be taken for a small variety of it; there are, however, points of difference which I think clearly indicate its right to be considered as a distinct species; besides its smaller size, its metathorax, looked at from in front, is not distinctly margined and truncate on the brow, is narrower towards the apex, and less rugose at the base; the 1st segment of the abdomen is rather more shining, punctured only on its apical half, and the puncturation distinctly sparser; the abdomen also is more elongate and more depressed.

The ♂, which I believe belongs to this species, is black, with the apex of the clypeus, the labrum, and the mandibles yellow; the antennæ reaching to about the

1st abdominal segment and fulvous beneath; the thorax closely and distinctly punctured; the metathorax very rugose, looked at from in front somewhat truncate, its basal area indefinite, irregularly rugose; the abdomen is not very shining, distinctly punctured, the 1st segment rather more sparsely so than the others. Legs with the apex of the femora and the base of the tibiæ, and sometimes also the apex, and the tarsi, pale yellow; (for genitalia see pl. ix., fig. 11). Length 6—7 mm.

Hab. Not common; Isle of Wight, Chobham, &c.

I believe this ♂ is the same as that described by Smith, but I cannot follow him in the description of the metathorax; he says, "the truncations irregularly transversely striate," and I am not clear as to his meaning.

15. *Halictus pauxillus*, Schenck.

Schenck, Jahr. Ver. Nat. Herz. Nassau, xiv., 1859, p. 287.

Smaller than any of the preceding, and about the size of *nitidiusculus* and *minutus*.

♂ only differs from that of the preceding species in being smaller, with a rounder face, rather shorter antennæ, and almost impunctate 1st abdominal segment; the following segments also being more shining and less closely punctured than in *longulus*; (for genitalia see pl. ix., fig. 10).

♀ black; head and thorax punctured, the latter more remotely than in any of the other species of this group, somewhat shining, and with a strongly marked dorsal impression extending in some specimens to within a third of the base of the mesothorax; nervures of the wings piceous; metathorax clathrately rugose up to its brow, which is somewhat rounded, without prominent angles; a slightly raised line runs below the brow on each side, giving the metathorax, in certain positions, a truncate appearance; this character, however, seems to vary. Abdomen with the posterior margins of the segments widely testaceous; basal segment very shining, almost impunctate; following segments dull, clothed with a fine greyish yellow pubescence, and under a strong lens seen to be finely punctured; 2nd segment with a lateral spot of white pubescence at the base. Legs inclining to be piceous, covered, as also the under

side of the abdomen, with long yellowish grey hairs. Length 5—6 mm.

Hab. Charlwood, Surrey; Hastings; Shere.

I have no doubt this species is generally common, though overlooked, as its ♀ very much resembles *nitidiusculus* in general appearance; its much more rugose metathorax, which is clathrately rugose right up to the brow and not only at the base, and its much more deeply punctured mesothorax, will easily distinguish it. The ♂ lacks the long ventral hairs of *nitidiusculus*.

16. *Halictus subfasciatus*, Nyl.

Nyl., Not. Salls. Faun. Flor. Fenn., Förh. ii., p. 200; Smith, Cat. Brit. Hym., 2nd ed., p. 92; ♂ = *fulvicornis*, K. = *lævigatus*, Sm., Cat. Brit. Hym., 2nd ed.

♂ very distinct from any of the other black species by its very long antennæ, which reach as far as the 3rd abdominal segment. Head and thorax dull, very finely and very closely punctured, sparsely clothed with greyish yellow hairs. Clypeus pale yellow; face below the antennæ clothed with silvery hairs. Antennæ beneath bright fulvous. Wings with nervures piceous. Metathorax truncate behind, very rugose, the rugosities somewhat longitudinal at the base. Abdomen deep black, shining, all the segments distinctly punctured at the base, impunctate at the apex; 2nd and 3rd with a white basal band, often only visible at the sides. Apical segment with an angulated carina. Beneath with the segments flat, their apical margins nearly straight; the 6th rounded; (for genitalia see pl. ix., fig. 12). Legs with the tarsi, and sometimes the knees and apices of tibiæ, pale yellow.

♀ with the head and thorax punctured much as in the ♂, although perhaps not quite so closely. Metathorax sharply truncate posteriorly, its angles prominent; surface shining, longitudinally and somewhat clathrately rugose. Abdomen with the basal segment very shining, in most specimens impunctate, but occasionally with a few very shallow fine punctures; following segments less shining, clothed with fine short yellowish grey hairs; 2nd and 3rd segments at the base with small lateral white spots, often scarcely observable, as they are easily rubbed off. Apex of each segment

testaceous; beneath and legs clothed with yellowish grey hairs. Length 6—8 mm.

Hab. Reigate, Shere, Chobham, Worthing, Yorkshire, Scotland, &c.

Division IV.

(2)	1. Abdomen impunctate, or nearly so	*lævis.*
(1)	2. Abdomen punctured.	
(6)	3. Puncturation of thorax remote, not very coarse; flagellum of antennæ pale beneath in ♂.	
(5)	4. Smaller; antennæ of ♂ only just reaching to the scutellum; puncturation of thorax in the ♀ exceedingly fine	*brevicornis.*
(4)	5. Larger; antennæ of the ♂ reaching to the metathorax; puncturation of thorax in ♀ not very fine	*villosulus.*
(3)	6. Puncturation of thorax very coarse, giving it almost a rugose appearance; ♂ with the flagellum entirely black	*puncticollis.*

17. *Halictus villosulus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 62; Smith, Cat. Brit. Hym., 2nd ed., p. 91.

Black; the tarsi of the ♂ generally pale, but often dark outwardly.

Head closely and finely punctured; the face below the antennæ in the ♂ covered with silvery hairs. Vertex of the head and the thorax in both sexes sparingly clothed with long brownish grey hairs. Antennæ of the ♂ reaching to about the metathorax, pale beneath; in the ♀ only more or less rufescent towards the apex. Thorax very smooth and shining in both sexes, sparsely and shallowly punctured, the puncturation rather closer towards the margins. Metathorax rounded posteriorly in the ♂, somewhat truncate in the ♀, radiately rugose at the base; surface beyond the rugosities shining. Abdomen in the ♂ shorter and more ovate than in most of the species, shining, finely and regularly punctured on all the segments; sides and apex of the body covered with grey hairs; in the ♀ with the basal segment impunctate or nearly so; the following ones finely punctured and clothed with grey hairs; margins of all the segments narrowly testaceous. Abdomen beneath clothed with long greyish hairs in both sexes. Legs with greyish yellow hairs; (for ♂ genitalia see pl. ix., fig. 15). Length 7—8 mm.

Hab. Very common on *Crepis* and other yellow Compositæ.

18. *Halictus puncticollis*, E. Saund.

E. Saund., Ent. Mo. Mag. xv., p. 200 = *puncticollis*, Mor.?

Very like the preceding, but slightly larger. The ♂ with the face longer and narrower; the antennæ entirely black. Thorax less shining and more closely punctured; metathorax much more rugose, its basal area distinctly enclosed. Abdomen much as in *villosulus*; (for genitalia see pl. ix., fig. 7.)

♀ with the face rather longer than that of *villosulus*; the thorax with much larger, more rugose, punctures, which, instead of being distant from each other about the width of three or four punctures, are scarcely distant more than two; metathorax clathrately rugose, basal area bounded by a raised line. Abdomen much like that of *villosulus*, but with only the margins of the 3rd and following segments testaceous. Length 8—8½ mm.

Hab. Hastings and Guestling.

19. *Halictus lævis*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 65; Smith, Cat. Brit. Hym., 2nd ed., p. 98.

Of this species I believe there are only two or three recorded British specimens, all of which are females.

It may be readily known by its large impunctate, or nearly impunctate, abdomen; the metathorax is formed very like that of *villosulus*, and the puncturation of the thorax is rather closer than in that species; the tarsi also are testaceous; it is a decidedly larger insect than *villosulus*. Length 8½ mm.

Hab. The only recorded locality is that given by Kirby—Nacton, Suffolk.

I cannot agree with Smith in thinking that Schenck's *lævis* is different. Smith owns that there are a few very fine punctures at the extreme base of the 2nd segment, and Schenck only says that Nylander was wrong in saying of the abdomen "absque ullâ punctura"; his description agrees excellently with our insect in all other respects. Smith quotes Thomson's *lævis* as identical with Kirby's; but here again, I think, he is mistaken, as

Thomson says "Mesonoto dense subtilissime punctato," which will not suit Kirby's species at all, and doubtless should be applied, as Thomson himself shows in his synonymy, to *subfasciatus*, Nyl.

20. *Halictus brevicornis*, Schenck.

Schenck, Jahr. Ver. Nat. Herz. Nassau, xxi., xxii., p. 310.

♂. Smaller than *villosulus*; face rather round, covered with white hairs in front. Mandibles, labrum, and apex of clypeus, yellow; extreme apex of mandibles pitchy. Antennæ short, only just reaching to the scutellum, pale beneath. Vertex and thorax sparingly clothed with greyish hairs. Mesothorax more closely punctured than in *villosulus*. Wings with the 2nd submarginal much wider than in that species. Metathorax radiately striate at the base. Abdomen short, dull, all the segments regularly punctured, the apical margins of the 3rd and following ones narrowly testaceous; beneath clothed with rather short hairs. Legs with the base and apex of the tibiæ, the front of the anterior tibiæ, and all the tarsi, yellowish white; (for genitalia see pl. ix., fig. 14.)

♀. Head finely and closely punctured, thorax very finely and remotely, its surface shining. Metathorax very finely and irregularly radiately striate at the base, shining on the actual brow. Abdomen with the basal segment shining, finely punctured, and hairy at the sides, disk glabrous and nearly impunctate; following segments closely and finely punctured, their apical margins widely testaceous, and their surface rather densely clothed with white hairs; the 2nd and 3rd segments with a little white lateral pubescence at the base. Legs clothed with pale greyish hairs; each segment of the abdomen beneath with a long fringe of greyish hairs. Length 5—6 mm.

Hab. I have taken the ♂ at Hayling Island and Bournemouth, but have not seen a British example of the ♀. I have described the latter sex from a continental specimen received from Mr. C. Ritzema.

Division V.

(10) 1. Not very small; dorsal line of thorax in ♀ not deeply impressed; ♂ with the 1st segment of abdomen not very convex longitudinally; 2nd not much depressed at the base.

(7) 2. 1st segment of the abdomen, at least on its apical half, and the 2nd and 3rd closely punctured, tarsi of ♂, whitish.

(4) 3. Face very elongate in both sexes; 1st segment of abdomen dull, finely punctured all over; 2nd segment, in fresh examples, with a lateral line of white pubescence at base .. .. .. *punctatissimus.*

(3) 4. Face shorter; 1st segment of abdomen polished and impunctate on the basal half.

(6) 5. Face as long as wide; puncturation of thorax and abdomen very fine .. .. *nitidiusculus.*

(5) 6. Face wider than long (♀); puncturation of thorax and abdomen coarser .. .. .. *breviceps.*

(2) 7. 1st segment of abdomen very polished and shining, scarcely punctured at all, or at most only irregularly near the apex; 2nd and 3rd segments shining, irregularly punctured; ♂ tarsi dark or fuscous.

(9) 8. Larger; face rather more elongate; abdomen more convex and ovate; ♂ tarsi testaceous-brown .. .. *atricornis.*

(8) 9. Smaller; face less elongate; abdomen flatter, less ovate; tarsi of ♂ dark .. .. *minutus.*

(1) 10. Very small; dorsal line of thorax in ♀ deeply impressed; ♂ with 1st segment of abdomen very convex longitudinally; 2nd much depressed at the base .. .. *minutissimus.*

21. *Halictus punctatissimus*, Schenck.

Schenck, Jahr. Ver. Nat. Herz. Nassau, ix., 1853, p. 147 = *longiceps*, E. Saund. = *porcus*, Mor. ?

This species may be known from all our other small black ones by the great length of the face.

♂. Head closely punctured. Apex of the clypeus, labrum, and mandibles pale yellow, tips of the last pitchy; face in front covered with white silvery hairs, in shape much longer than wide across the eyes. Antennæ pale beneath, reaching to about the base of the metathorax. Vertex, and thorax, especially round its sides, sparingly clothed with greyish hairs; mesothorax strongly and distinctly punctured; metathorax rather short, somewhat rounded posteriorly, longitudinally rugose at the base. Abdomen slightly shining, wider than

in most of the species of this group, rather largely and distinctly punctured on the first three segments, less distinctly on the following ones; beneath with a few long hairs across the 1st, 2nd, and 3rd segments, and some shorter ones on the 4th and 5th; (for genitalia see pl. ix., fig. 13). Legs with the tarsi pale whitish yellow; the extreme apex of the femora more or less testaceous.

♀. Head shaped much as in the ♂. Eyes very long and subparallel; face much longer than wide. Thorax deeply and distinctly punctured, its surface dull; metathorax as in the ♂. Abdomen with the 1st segment more shining than the rest, finely but not very closely punctured on its apical half; following segments closely punctured, and more or less densely clothed with greyish hairs; segments beneath fringed with long greyish hairs. Legs black, clothed with grey hairs; apices of the tarsi piceous. Length 6—7 mm.

Hab. Not rare. Wandsworth, Reigate, Chobham, Hastings, Southwold, Bournemouth, Norwich, &c.

22. *Halictus nitidiusculus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 64; Smith, Cat. Brit. Hym., 2nd ed., p. 101.

♂. Black, but in certain lights with a very slight bronzy appearance; head much shorter than in the preceding, the antennæ longer, testaceous beneath; mandibles, labrum, and apex of clypeus yellow; mesothorax shining, very finely punctured; metathorax finely rugose at the base. Abdomen shining, elongate, very finely punctured; beneath shining, segments somewhat concave, sides of the segments with long tufts of white hair, which form a conspicuous and distinctive character; (for genitalia see pl. ix., fig. 16). Legs with the front of the fore tibiæ, the base and apex of all the tibiæ, and all the tarsi, pale yellow.

♀. Much like all the other females of this group, but with the testaceous margins of the abdominal segments generally very wide, and distinguishable by the very fine puncturation of the thorax and of the basal segment of the abdomen; these two characters together do not exist in any of our other species; in *punctatissimus* and *brevicepS*, where the 1st segment of the abdomen is

punctured, the puncturation of the thorax is coarse; in *minutus*, *atricornis*, and *minutissimus* the 1st segment is impunctate or nearly so; *minutus* is its closest ally, but the thorax in that species is more shining, less closely and more largely and deeply punctured, and all the segments of the abdomen are less closely punctured, especially the 2nd and 3rd. Length 6 mm.

Hab. A common species, and generally distributed.

23. *Halictus minutus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 61; Smith, Cat. Brit. Hym., 2nd ed., p. 100.

Deep shining black; ♂ with the apex of the clypeus, labrum, and mandibles pale. Antennæ beneath fulvous; head closely punctured in both sexes. Thorax shining, not so finely punctured as in *nitidiusculus*, and more remotely. Wings with the nervures pitchy brown. Metathorax rounded posteriorly, longitudinally rugose at the base. ♂ with the abdomen very shining; basal segment finely and rather remotely punctured on its apical half; following segments punctured at the base, impunctate towards the apex; surface with a few scattered short white hairs, beneath with the segments without fringes or lateral tufts of hair; (for genitalia see pl. ix., fig. 17). Legs black; tarsi piceous, paler towards the apex.

♀. 1st segment of abdomen very shining, with a few shallow punctures towards the apex; following segments irregularly and remotely punctured, apical margins of the segments scarcely discoloured, surface sparsely clothed with greyish hairs. Legs with grey hairs. Length 6 mm.

Hab. Not common; Chobham, Shere, &c. ♀ probably often mistaken for *nitidiusculus*, and *vice versâ*.

24. *Halictus breviceps*, E. Saund.

E. Saund., Ent. Mo. Mag. xv., p. 200.

♀. Easily distinguished from its allies by its short wide head, which is much wider across the eyes than long, its largely and deeply punctured thorax, and the testaceous nervures of its wings. The basal segment of the abdomen is very shining, but punctured at its apex,

and all the following segments are punctured, their apical margins widely testaceous. Length 6 mm.

Hab. Chobham, Shere, Hayling Island, &c.

I do not know the ♂ of this species.

25. *Halictus atricornis*, Smith.

Smith, Ent. Ann., 1870, p. 26; Cat. Brit. Hym., 2nd ed., p. 100.

Very like *minutus*, but larger, differing in the following particulars :—

♂. With the puncturation of the thorax less regular and rather stronger; the brow of the metathorax not so smooth and shining, and rather more largely rounded. Abdomen very polished; the puncturation at the base of the 2nd and following segments much less close and shallower, that of the basal segment scarcely observable; tarsi paler. Genitalia very distinct, each apex of the stipites being produced into two elongate processes (see pl. ix., fig. 19); whereas in *minutus* the outer process is turned backwards under the body of the stipes.

♀ with the face longer than in *minutus*, the mesothorax more convex, the metathorax more widely rounded, as in the ♂, the abdomen much more convex and ovate, the margins of the segments almost concolorous; 1st segment with scarcely visible punctures; the 2nd and following with an extremely fine puncturation at the base; sides and apex of the abdomen with a few greyish hairs. Legs with greyish yellow hairs. Length $6\frac{1}{2}$—$7\frac{1}{2}$ mm.

Hab. Cheshire (B. Cooke). I know of no other locality.

26. *Halictus minutissimus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 63; Smith, Cat. Brit. Hym., 2nd ed., p. 102.

♂. Black; the extreme apex of the clypeus white; mandibles piceous. Antennæ reaching to the base of the metathorax, piceous beneath; mesothorax dull, strongly punctured; metathorax rather long, finely rugose at the base, shining and polished beyond the rugosities. Abdomen largely and distinctly punctured

on all the segments; basal segment very convex, narrowly and deeply impressed at the apex; 2nd segment depressed at the extreme base, then very convex and impressed again at the apex, which is pale and somewhat membranous; 2nd and following segments clothed with greyish hairs; segments beneath fringed with whitish hairs; (for genitalia see pl. ix., fig. 20). Legs entirely black, clothed with greyish hairs.

♀. Narrower than any of the preceding species; face rather elongate; mesothorax largely punctured, with a very deep dorsal line in front; metathorax rugose at the base, but not shining at the apex as in the ♂; basal segment of abdomen very shining, with a few scattered punctures; 2nd and following closely punctured, and clothed with greyish hairs; segments beneath with long hairs. Legs clothed with greyish yellow hairs. Length 5—5½ mm.

Hab. Common and generally distributed.

The small size and narrow form of the ♀ readily distinguish it from its allies; the ♂ is abundantly distinct by its black tarsi and the shape of the 1st and 2nd abdominal segments.

Division VI.

4) 1. Tibiæ and tarsi of ♂ yellow; ♀ with the abdomen densely hairy, with paler apical bands to the segments.

(3) 2. Hairs of the thorax in ♀ fulvous; pubescence of head and thorax very dense. ♂; antennæ not nearly so long as body .. .. *gramineus.*

(2) 3. Hairs of thorax in ♀ whitish; pubescence of head and thorax not dense. ♂; antennæ as long as body .. .. *tumulorum.*

(1) 4. Tibiæ of ♂ not yellow; ♀ with the abdomen not densely hairy; no pubescent apical bands to the segments.

(6) 5. Abdomen with a bright æneous tinge .. *Smeathmanellus.*

(5) 6. Abdomen black, or nearly so.

(8) 7. ♂ tarsi black; surface of thorax in both sexes not very shining; the intervals between the punctures, under a strong power, seen to be finely rugose or scratched; face subelongate *morio.*

(7) 8. ♂ tarsi whitish; surface of thorax in both sexes shining, and quite smooth between the punctures; face subrotundate .. .. .. *leucopus.*

27. *Halictus tumulorum*, Linn.

Linn., Syst. Nat., ed. x., i., p. 574; Smith, Cat. Brit. Hym., 2nd ed., p. 94.

Bronzy green; head finely and closely punctured.

♂. With the apex of the clypeus, mandibles, and labrum pale yellow. Antennæ very long, extending almost to the 2nd abdominal segment, pale beneath; face covered with grey hairs; mesothorax rather largely and closely punctured; metathorax rounded posteriorly, rugose at the base. Abdomen elongate, strongly and closely punctured; 1st segment impressed at the apex; 2nd and 3rd much impressed at the base, apical margins more or less testaceous and impunctate; each segment has a slight apical band of pale hairs; beneath with the 5th segment deeply emarginate; the 6th subtruncate at the extremity, and with a small basal fovea; (for genitalia see pl. ix., fig. 6). Legs pale yellow.

♀. Head and thorax punctured as in the ♂. Antennæ fulvous beneath towards the apex; metathorax somewhat truncate posteriorly. Abdomen closely punctured, clothed with slightly golden hairs; the base of the 1st segment at the sides, a band at its apex, a band at the base and apex of the 2nd and 3rd, and a band at the apex of the 4th, covered with white hairs; 5th segment covered with golden hairs at the apex, on each side of the central rima; 6th with the dorsal valve narrow and testaceous, carinated and raised at the base, with long golden hairs at the sides of the valve; segments beneath with long greyish hairs. Length 7 mm.

Hab. Common and generally distributed.

28. *Halictus gramineus*, Smith.

Smith, Zool. vii., App. 58; Cat. Brit. Hym., 2nd ed., p. 95.

Easily distinguished from the preceding by the short antennæ of the ♂, which reach only to about the middle of the metathorax, and the bronzy femora, and by the dense pubescence of the ♀, which is of a golden, almost fulvous, tinge; the tegulæ and nervures of the base of the wings are pale yellow, and the anterior tibiæ in front, and the base of the others, and all the tarsi, are more or less flavous. Length 6—7 mm.

Hab. A very rare species in England, and very distinct; the only recorded localities are Cove Common, Hants, and Devonshire. It is not rare in the South of Europe.

29. *Halictus Smeathmanellus*, Kirby.

Kirby, Mon. Ap. Angl. ii., App., p. 375; Smith, Cat. Brit. Hym., 2nd ed., p. 95.

Head and thorax bright bronzy green. Abdomen with a distinct bronzy green tint.

♂. Head and thorax bronzy green; head closely punctured, dull. Clypeus with a white spot at the apex. Antennæ pale beneath, reaching to the apex of the metathorax. Mesothorax shining, rather irregularly punctured, and clothed with scattered white hairs; the surface between the punctures bright and smooth. Metathorax rugose, somewhat rounded posteriorly. Abdomen elongate, bronzy or greenish black; abdomen very shining and polished, with the base of each segment punctured, the apex almost impunctate; in the impressions at the base of the 2nd and 3rd segments is a white pubescent band; (Kirby must have described from a rubbed specimen, as he particularly notices the absence of these bands); beneath clothed with long white hairs; (for genitalia see pl. ix., figs. 5*a*, 5*b*). Legs entirely black.

♀. Of a brighter colour than the ♂; the whole insect, except the legs and antennæ, being generally of a bright bronzy colour, the head and thorax rather more golden. Head rather elongate, dull, finely and closely punctured. Thorax shining, punctured, &c., as in the ♂. Abdomen shining, punctured at the base of the segments, narrowly testaceous at the apex; 2nd and 3rd with a white basal band of pubescence; 3rd and following clothed with scattered hairs, beneath with long hairs. Legs black, clothed with pale hairs. Apical joint of the tarsi more or less pitchy. Length 6—6½ mm.

Hab. Common in many places. Hastings, Bournemouth, London district, Norwich, Lowestoft, &c.

A very distinct species, easily known by its shining surface and bright brown-green abdomen.

30. *Halictus morio*, Fab.

Fab., Ent. Syst. ii., p. 306; Smith, Cat. Brit. Hym., 2nd ed., p. 97, var. = *æratus*, Kirby, Smith, &c.

♂. Head and thorax bronzy green, the former closely punctured, with the clypeus considerably produced, with

a white spot near the apex. Antennæ black, pale beneath, reaching to about the apex of the metathorax. Mesothorax dull, rather closely punctured, the intervals between the punctures very finely rugose. Metathorax rugose, rounded posteriorly. Abdomen black; segments rather strongly punctured, except at their extreme apices; 2nd and 3rd with a lateral basal spot of white pubescence, their basal region scarcely impressed; ventral hairs very short; (for genitalia see pl. ix., fig. 2). Legs black, clothed with short greyish hairs.

♀. Head and thorax dull, punctured, &c., much as in the ♂; face as long as wide across the eyes. Metathorax somewhat rounded posteriorly, rugose at the base. Abdomen black, shining, especially the basal segment, which has only a few scattered punctures; the following segments are more closely and finely punctured, and clothed with pale pubescence; the 2nd and 3rd with a lateral basal spot of white pubescence; segments beneath with long whitish hairs. Legs black, clothed with pale hairs. Length 6—7 mm.

Hab. Very common; the ♂ very variable in size. I feel sure that *æratus* is only a small variety.

31. *Halictus leucopus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 59; Smith, Cat. Brit. Hym., 2nd ed., p. 97.

♂. Head and thorax bright bronzy green. Clypeus pale at the apex; labrum and mandibles yellow, the latter rufescent at the apex. Antennæ short, not quite reaching to the scutellum, pale beneath. Mesothorax shining, rather coarsely punctured. Metathorax somewhat rounded posteriorly, rugose at the base. Abdomen black; segments punctured at the base, very smooth and shining at the apex, under side with very short hairs; (for genitalia see pl. ix., fig. 3). Legs black; base and apex of each of the tibiæ, and all the tarsi, pale yellowish.

♀. Exceedingly like *morio*, but differing in having the face much wider, it being decidedly wider across the eyes than long, the thorax more shining, the punctures rather larger, and the intervals between them smoother; the metathorax is rather more rugose, and more widely

rounded posteriorly, and the abdomen has no white lateral spots. Length 5—6 mm.

Hab. Not rare. London district, Norwich, Lowestoft, Southwold, Littlehampton, Bournemouth, Tunbridge Wells, Reigate, Chobham, &c.

The ♂ is very distinct from any other species.

Andrena, *Fab.*

Fab., Syst. Ent., p. 376. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd ed., pl. vi.

Tongue lanceolate; paraglossæ not acute; labial palpi 4-jointed; maxillary palpi 6-jointed. Anterior wings with three submarginal cells. ♂ generally with the head wider than that of the ♀, the vertex often subquadrate; in some species with the head enormously enlarged, and the mandibles long and falcate; the size of the head, however, varies very much amongst specimens of the same species. Clypeus sometimes white. Abdomen generally narrower than in the ♀, and with the 8th or apical ventral plate narrowed and elongate towards the apex, generally somewhat dilated at the extremity, and often emarginate; the 7th ventral plate hidden in nearly all the species under the 6th; the genitalia of the males of the different species bear a very strong general resemblance to one another, and in this respect the genus contrasts curiously with *Halictus*, *Prosopis*, &c., where the genitalia of each species give such characteristic distinctions. ♀ with the abdomen usually ovate, sometimes nearly glabrous, but generally either clothed all over with long hairs, or else banded with pale hairs at the apex of the segments; 5th and 6th segments densely clothed with hairs, which are often of a different colour to those on the rest of the abdomen. Apical dorsal valve with its centre glabrous, the glabrous portion of a triangular shape; posterior legs of the ♀ with a tuft of curled hairs on the trochanters, generally called the "floccus;" this in many species is composed of very long hairs, and forms a prominent character; the posterior tibiæ are outwardly clothed with long hairs, which form the "scopæ," and on their inner surface, or that towards the body, they are clothed with hairs, having flattened and dilated apices, so formed probably for cleaning purposes. At the base of the tibiæ is a

glabrous flattened disk called the "patella"; this in some of the species is very prominent, and projects so as to look like a tooth if viewed sideways. The basal joint of the posterior tarsi is elongate and dilated, and covered with bristly hairs.

The most important structural characters in the ♂ seem to be found in the labrum, the clypeus, the antennæ, especially in the relative lengths of their 2nd, 3rd, and 4th joints, the puncturation, and the form of the 8th or terminal ventral segment; in the ♀ the characters seem chiefly to lie in the shape of the face, the puncturation, and the sculpture of the dorsal portion of the 6th segment.

The colour of the pubescence, &c., also affords good characters, but exposure to the weather greatly alters the general look of the insects, and the colour rapidly fades. The little parasite *Stylops*, so well known to hymenopterists, is often the cause of considerable variation in these insects; its presence may generally be detected by the deformed appearance of the bee's body, or by the actual protrusion of a portion of its own body from between the segments of that of the bee; it projects something like a small brown seed more or less flattened, and the variations caused by its presence are well worthy of notice. I have to thank Professor Perez, of Bordeaux, for some very interesting remarks on this subject.

If a ♂ be stylopised, its general appearance becomes more like that of a ♀; if a ♀ be stylopised, it becomes more like a ♂: thus, in the case of a ♂, its head tends to become smaller, the pubescence of the abdomen to become denser and paler, and to form bands at the apices of the segments, the legs to become more densely hairy, and in the species where the clypeus is white it tends to become black or spotted; in the case of a ♀ the head tends to become smaller, as in the ♂, the scopæ to become less dense and paler, as also the pubescence of the body, but like as in the ♂ it tends to form pale bands at the apices of the segments, and in species where the ♂ has the clypeus white, the stylopised ♀ often has that part white also or spotted with white; there also seems to be a tendency in both sexes to assume a somewhat pallid, immature appearance. The effects of stylopisation vary very much in different specimens, some hardly showing any variation from the typical form, others varying to such an extent as to be hardly

recognisable. From the nature of these variations it would appear probable that the genital organs are in some way injured by the parasite while the insect is in the larval state. Up to the present time as many as five so-called species have existed in our list whose characters depend entirely, as far as I can see, on the effects of stylopisation, viz., *Mouffetella*, Kirby, = *atriceps* ♂; *picipes*, Kirby, and *picicornis*, Kirby, both of which = *Trimmerana* ♂ and ♀; *Aprilina*, Smith, = *nigro-ænea* ♂; and *convexiuscula*, K., = *Afzeliella*.

There can be, I think, little doubt that many of our species are double-brooded, the first brood appearing about the end of March or in April, the second appearing in July or August; in some cases the two broods resemble one another almost exactly, as in *pilipes*, *thoracica*, *fulvicrus*, and *Afziella*; in others the males are pretty easily distinguishable by various characters of colour, pubescence, &c.; whereas the females are almost exactly alike. This difference in the males has caused entomologists to consider the two broods as representing two distinct species; thus, *bimaculata* and *decorata*; *Gwynana* and *bicolor*; *parvula* and *minutula*; *dorsata* and *combinata*: all, I believe, belong to species which have a spring and autumn brood; and this view, I think, receives support from the fact that in the localities where the spring form occurs the autumn form is found also; that there should be a slight difference between the two broods does not seem to be unnatural, as the food supplied to the larvæ in each case must almost necessarily be different; as a rule, the species which frequent the sallow in the early spring frequent the flowers of *Rubus* in the summer.

The bees of this genus, as a rule, form colonies of greater or less extent either in hedge-banks or pathways, or other exposed surfaces of earth; and consequently, in most cases, if one specimen is met with, others are sure to be found near the same spot; the males, however, do not always occur with the females: for instance, the female of some species may be abundant on the flowers of a sallow-bush; the males very likely will be seen coursing up and down the hedge under the sallow, or just above the ground if their colony is close by; the males also seem to come out earlier and stay out later than the females, and they may often be found flying about as late as 5 or 6 o'clock. Mr. F. Smith has given such an excellent account of the general habits, &c., of these

insects in his last book,* that I do not think I need do more than refer to his remarks, which will be found at the commencement of his description of the species of *Andrena* (p. 21). I have in some cases changed the names which have hitherto been used, taking always the first name given to the species, whether the description is from a ♂ or ♀.

Care should be taken not to mistake the yellow of the pollen on the scopæ for the real colour of the hairs themselves.

(2)	1. Abdomen in both sexes generally more or less red, at least beneath; or large, with the wings brownish. ♂, clypeus white; ♀, anal fringe golden	Div. I.
(1)	2. Abdomen black, or sometimes more or less red; but in the latter case with the clypeus in the ♂ black, and the anal fringe of the ♀ dark.	
(4)	3. Metathorax with its basal area largely and coarsely clathrate, bounded posteriorly by a raised line	Div. II.
(3)	4. Metathorax with its basal area smooth, or punctured, or finely rugose; rarely finely clathrate; not bounded posteriorly by a raised line.	
(6)	5. ♂ larger or medium-sized, without distinct, pale pubescent bands at the apices of the abdominal segments; clypeus not white; tibiæ entirely dark (except in *Clarkella*, where they are sometimes pale at the apex). ♀ large, with dark brown or black apical fringe; abdomen often densely hairy; or medium-sized, without either distinct clearly defined apical bands of pale pubescence, or lateral white streaks to the abdominal segments; apical fringe always dark; tibiæ always dark (except in *Clarkella*), although sometimes clothed with golden hairs.	Div. III.
(5)	6. ♂ with distinct abdominal bands; or very small; or with the clypeus white; or with the tibiæ more or less pale. ♀ large, with golden apical fringe (*labialis*); or medium sized, with golden apical fringe; or if with dark apical fringe, then with distinct, well defined, pale apical bands, or white lateral streaks to the abdominal segments; or entire insect very small; tibiæ often pale and translucent.	
(8)	7. ♂, head very large. ♀ with the mandibles produced into a membranous wing beneath; abdominal segments testaceous at the apex ..	Div. IV.
(7)	8. ♂, head of normal size. ♀, mandibles simple; abdominal segments not testaceous at the apex.	

* 'Catalogue of British Hymenoptera in the British Museum,' 2nd ed., pt. 1. Andrenidæ and Apidæ. 1876.

(10) 9. ♂ with the abdominal pale bands entire; or if interrupted, then with the basal area of the metathorax defined by a smoother line at the sides and apex, and the mandibles long and falcate; clypeus black; tibiæ entirely dark. ♀, bands of abdomen entire .. .. .. Div. V.

(9) 10. ♂ with one or more of the abdominal bands, when present, interrupted; basal area of metathorax not defined by a smoother line at the sides and apex, often undefined altogether; clypeus sometimes white; tibiæ in some species more or less pale. ♀, pubescent bands of the abdomen, when present, interrupted as in the ♂.

(12) 11. Abdomen polished and shining .. .. .. Div. VI.

(11) 12. Abdomen not polished and more or less dull, either from the closeness of the puncturation or from the fine rugulosities of the surface between them .. .. Div. VII.

Division I.

(2) 1. Large; wings more or less brown; abdomen shining, finely and remotely punctured .. *Hattorfiana.*

(1) 2. Medium sized; wings almost clear; abdomen dull, except the 1st segment, and closely punctured.

(4) 3. 2nd and 3rd segments of abdomen with a pale apical band of hairs .. .. *Cetii.*

(3) 4. 2nd and 3rd segments of abdomen naked at the apex .. .. *cingulata.*

1. *Andrena Hattorfiana*, Fab.

Fab., Syst. Ent., p. 389 (*Nomada*); Smith, Cat. Brit. Hym., 2nd ed., p. 26.

Large, black, shining; ♀ often with the abdomen more or less red; wings brown.

♂. Clypeus white, with a small black dot on each side; apical margin looked at from above truncate, black; antennæ short, scarcely longer than those of the ♀; vertex rugosely punctured, clothed like the face with greyish hairs; mesothorax shining, punctured, covered with grey hairs; metathorax dull, very rugosely punctured and hairy. Abdomen shining, sparsely punctured, the apical margins of the segments widely piceous and somewhat impressed. Apex clothed with golden hairs; segments beneath fringed with golden hairs; (for genitalia see pl. xi., fig. 5). Legs with the tarsi more or less testaceous.

♀. Larger than the ♂. Clypeus black; each side of the face with a line of pale pubescence, and a slight

depression near the inner margin of the eye, filled with very short shining adpressed hairs. Thorax much like that of the ♂, but less hairy, and the metathorax rather more rugose. Abdomen shining, sometimes black as in the ♂, sometimes with the 1st and 2nd segments and apical margin of the 3rd, ferruginous-red; the base of the 1st and 2nd generally black; between these forms great variation occurs. Surface very finely punctured; 2nd, 3rd, and 4th segments with a lateral streak of whitish hairs; 5th and 6th clothed densely with golden hairs; segments beneath fringed with long hairs. Legs black; tarsi more or less testaceous; tibiæ clothed with long golden grey plumose hairs. Length 14—16 mm.

Hab. Ventnor; Erith, Darenth, Birch Wood, Kingsdown near Walmer, Kent; Teignmouth and Dawlish, Devon; and S. Wales. It is found chiefly on the common Scabious, according to F. Smith, and the high coloration of the ♀ he thinks depends upon the dryness or heat of the season, as in hot dry summers he has found nearly all the females coloured.

2. *Andrena Cetii*, Schrank.

Schrank., Enum. Ins. Austr., p. 405; Smith, Cat. Brit. Hym., 2nd ed., p. 31.

♂. Black, shining; head deeply emarginate posteriorly, wider than the thorax, clothed with grey hairs. Clypeus white; apical margin and two small discal spots black, deeply emarginate in front, with a raised tooth on each side of the emargination; labrum tuberculated, the tubercle filling up the emargination of the clypeus, and deeply impressed in front. Mandibles red at the apex. Thorax shining, punctured, clothed with rather long grey hairs; nervures of the wings pitchy brown; metathorax rounded, finely rugose. Abdomen shining, finely punctured, brownish black, the apical margins of the segments piceous; 5th, 6th, and 7th segments above clothed with white hairs at the apex; beneath with the 3rd, 4th, and 5th segments beautifully and densely ciliated at the apex, the ciliæ in the middle of each segment much shorter than the outer ones; 6th and apical segment densely hairy; (for genitalia see pl. x., figs. 4, 4*a*). Legs covered with long grey hairs.

♀. Head and thorax black, clothed with short

brownish grey hairs. Clypeus black, largely punctured; vertex and face, above the clypeus, rather more finely and closely. Thorax finely and closely punctured; pubescence beneath the wings and round the sides greyish white; wings somewhat smoky; metathorax finely rugose. Abdomen with the basal segment black, except at the apex, shining and rather remotely punctured, with a few scattered hairs; the other segments entirely pale yellow or brown, with the apical margins only pale, dull, very closely and finely punctured, and clothed with very short pale decumbent hairs, and with an apical band of longer hairs; 5th segment covered with long hairs which are bright golden at its apex, 6th with bright golden hairs, the central naked portion flat and triangular; beneath with the 3rd and following segments ciliated at the apex. Legs: femora clothed with long white hairs; tibiæ and tarsi with brown hairs, posterior tibiæ with the scopæ dense and brown, the inner side of the tibiæ nearest the body with long white hairs. Length 9—10 mm.

Varies greatly in colour, one or more of the apical segments often being fuscous, and the intermediate segments yellow.

Hab. A local and generally rare species. Kingsdown, near Deal, Croydon, Dartford, Lewes, Norwich, Parley Heath, Hants, and Coombe Martin, North Devon. I have never taken this species myself; it occurs on the wild scabious in July and August.

3. *Andrena cingulata*, Fab.

Fab., Syst. Ent., p. 390 (*Nomada*); Smith, Cat. Brit. Hym., 2nd ed., p. 32.

Head and thorax black, clothed with whitish hairs, the pubescence in the ♂ longer than in the ♀; vertex of the head, and face above the antennæ very closely punctured. Clypeus largely punctured, white in the ♂, with the apical margin narrowly and two small discal spots, black; the face at the sides of the clypeus also white in this sex. ♀ with a line of short velvety pubescence near the inner margin of the eye. Antennæ fulvous beneath, towards the apex, in both sexes. Mesothorax slightly shining, punctured. Metathorax finely rugose. Abdomen closely punctured, the basal segment, except the extreme apex, and the 4th and following segments, except a spot on

each side of the base of the 4th, black, the remainder bright red; 4th and following segments with an apical fringe of pale hairs; those of the 5th and 6th in the ♀ brownish, and the 6th and 7th in the ♂ more or less golden; segments beneath with pale apical fringes. Legs in the ♂ with white hairs, in the ♀ with brown, scopæ dense and brown. Length 8—9 mm.

Hab. Not uncommon, in the summer, on *Veronica chamædrys*. There is no other species of the genus with which it can be confounded, and the ♂ and ♀ in shape are almost exactly alike.

Division II.

(2)	1. Apex of abdomen golden in both sexes	*albicans*.
(1)	2. Apex of abdomen dark in both sexes.	
(4)	3. Entire insect black; hairs of thorax in ♂ and hairs on under side of scopæ in ♀ alone pale..	*pilipes*.
(3)	4. Head and thorax clothed with brown hairs; abdomen with pale hairs.	
(6)	5. ♂, abdomen dull, not shining; immaculate beneath; genitalia very large; apex of tibiæ generally pale. ♀, posterior tibiæ clear testaceous; clothed with golden hairs	*atriceps*.
(5)	6. ♂, abdomen more or less shining, sometimes spotted with red on the 2nd segment; genitalia small; tibiæ black. ♀, posterior tibiæ black, clothed with pale yellowish hairs	*bimaculata*.

4. *Andrena albicans*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 94; Smith, Cat. Brit. Hym., 2nd ed., p. 37.

♂. Black; face, legs, and sides of the thorax below the wings and apex of the abdomen clothed with golden brown hairs; mesothorax with the hairs darker and of a redder brown; 6th segment above testaceous at the apex; intermediate tarsi and posterior tibiæ and tarsi testaceous, except a more or less extended black spot on the tibiæ, which occurs in many varieties.

Head closely punctured, about as wide as the thorax; antennæ entirely black, reaching to about the apex of the metathorax. Mesothorax closely and coarsely punctured; metathorax with a well defined clathrately rugose basal area, sides of the metathorax beyond it finely rugose, and densely hairy. Abdomen shining, strongly and rather closely punctured; apical portions of the 2nd and

following segments impressed; segments beneath punctured, fimbriated at the apex.

♀. Black; thorax and apex of the body clothed with bright red hairs; intermediate tarsi and posterior tibiæ and tarsi clear testaceous, densely clothed with golden hairs.

Head deeply and closely punctured; face with white hairs, and a line of velvety pale pubescence near the inner margin of each eye. Mesothorax largely and closely punctured, but so densely covered with hairs that the puncturation is seen with difficulty. Metathorax with a well defined basal area, as in the ♂. Abdomen slightly shining, strongly punctured; 1st, 2nd, and 3rd segments glabrous or nearly so, except at the sides; 5th and 6th densely clothed with golden-red hairs; 6th with the disk of the glabrous central portion triangularly raised; segments beneath punctured, with pale apical fringes. Length 10—11 mm.

Hab. Very common in April and May, and generally distributed; it is one of quite the early spring bees; the ♀ is distinct from any other species by the bright red apex of the abdomen; the ♂ is like several others in general appearance, but the testaceous apex of the abdomen and the clear yellow tibiæ in most cases will distinguish it; while the clathrate basal area of the metathorax and the strongly punctured abdomen are unfailing structural characters.

5. *Andrena pilipes*, Fab.

Fab., Species Ins., i., p. 474; Smith, Cat. Brit. Hym., 2nd ed., p. 34.

Black, clothed with black hairs; pubescence of the thorax in the ♂ griseous, and the hairs on the under side of the posterior femora and the outside of the scopæ in ♀ white. Wings smoky brown, with their apical margins darker.

Head and thorax rugosely punctured in the ♂, the latter rather more remotely in the ♀. Face of the ♂ very densely covered with long black hairs. Clypeus in the ♀ strongly and rugosely punctured. Metathorax in both sexes with a triangular clathrate inclosure at the base. Abdomen subelongate in the ♂, suboval in the ♀, rather irregularly and rugosely punctured; apex of each segment, except the 1st, impressed,

the impressed portion punctured; 5th and 6th in the ♀, and 6th and 7th in the ♂ densely covered with black hairs; beneath, the segments of the ♂ are shining, of the ♀ dull and densely punctured. Length 12—15 mm.

Hab. Not common; appearing sometimes as early as April, and found in August on flowers of *Rubus*, thistles, &c. Southend, Darenth, Shirley Common, Sidmouth, Norwich, Hastings, Chobham, Bournemouth, &c.

I do not think this species can be confounded with any other. Much worn specimens of the ♂ of *thoracica* sometimes rather resemble it, but the enclosed clathrate space on the metathorax and the punctured apical impressions of the abdominal segments will distinguish the present species easily.

6. *Andrena atriceps*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 70; Smith, Cat. Brit. Hym., 2nd ed., p. 43. Stylopized ♂ = *Mouffetella*, Kirby.

Thorax clothed with brown hairs. Face in the ♂ with brown mixed with black, in the ♀ with whitish, hairs. Abdomen clothed with pale hairs. Both sexes with a clathrate enclosure at the base of the metathorax. ♀ with the posterior tibiæ and tarsi clear testaceous. Scopæ golden.

♂. Head punctured and longitudinally strigose above the antennæ; face densely clothed with brown hairs, more or less mixed with black. Mandibles simple at the base. Antennæ reaching not quite to the apex of the metathorax. Thorax densely clothed with rather pale brown hairs; mesothorax irregularly and deeply punctured; metathorax clathrately rugose at the base. Abdomen elongate-ovate, rather densely clothed with upright pale hairs; the hairs of the 5th and 6th segments mixed with black; each segment, except the 1st, impressed at the apex, and with a very narrow apical band of slightly paler hairs; apical segment clothed with brown hairs. Surface finely punctured, scarcely shining. Beneath with posterior margins of the segments narrowly testaceous, fringed with longish hairs; genitalia very large. Legs black; the tibiæ of the posterior pair generally more or less testaceous towards the apex (but this is not a constant character); tarsi testaceous.

♀. Generally larger than the ♂, and, as in other species of the genus, wider. Face clothed with pale greyish pubescence more or less mixed with black at the extreme sides. Thorax punctured as in the ♂, but clothed, in fresh examples, with bright brown hairs on the mesothorax and scutellum, and paler hairs round the margins. Metathorax with a well-defined basal area, largely clathrate within, and bounded by a raised line. Abdomen shining, black, punctured, clothed with short, somewhat adpressed, ochreous-grey hairs, apical fimbria black; the glabrous exposed portion of the apical segment slightly and triangularly raised and rugose in the middle, round the edges shining and smooth. Segments beneath each with a slight central longitudinal depression, strongly punctured, with pale apical fimbria; posterior femora clothed with white hairs, floccus white; posterior tibiæ and tarsi clear testaceous, clothed with golden hairs. Length 13—15 mm.

Hab. A very common species in the spring.

Mouffetella, K., is a stylopized var. of the ♂. This species is most closely allied to *bimaculata*, but the clear testaceous hind tibiæ of the ♀, and the dull densely clothed abdomen and the large genitalia of the ♂, will readily distinguish it. The sectional character of the rugose basal area of the metathorax will at once separate it from *nigro-ænea* and others of that group with which it has a strong general resemblance.

7. *Andrena bimaculata*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 115; Smith, Cat. Brit. Hym., 2nd ed., p. 47 = *decorata*, Smith = *vitrea*, Smith.

Black; face clothed with sooty hairs, or brown hairs with sooty hairs mixed. Thorax with brown hairs. Metathorax with an enclosed rugose basal area. Abdomen in both sexes often with two dull red spots on the 2nd segment beneath; ♀ often with the apex of the basal segment, and sometimes of the 2nd, red above. Scopæ of ♀ with pale yellowish hairs. Legs of ♂ entirely black.

♂. Head deeply punctured, and densely covered on the face with long black hairs, or in some varieties with brown hairs mixed with black. Mandibles simple at the base. Antennæ reaching to not quite the apex of the

metathorax. Thorax clothed with dull greyish brown hairs. Mesothorax strongly punctured. Metathorax largely and clathrately rugose at the base. Wings clear, with a slight cloud along their apical margins, nervures pale. Abdomen somewhat elongate and rather shining, finely punctured, clothed with short greyish hairs; basal and following segments impressed along their apical margins, the impressions bearing rather denser bands of pale hairs, apical fimbria golden brown. Segments beneath finely and remotely punctured, fringed with long hairs, and ciliated with fine and very short hairs at their apical margin. Legs entirely black, clothed with greyish brown hairs.

♀. Head clothed with dark sooty or brown hairs, longitudinally strigose, and punctured above the antennæ. Thorax clothed with brown hairs, strongly punctured. Metathorax as in the ♂, the basal area triangular, enclosed by a well-defined raised line. Abdomen ovate, shining, finely and irregularly punctured, clothed somewhat sparingly with rather long pale hairs; 5th and 6th segments densely with black hairs. Apical portions of all the segments impressed; glabrous portion of the 6th dorsal segment raised in the centre; beneath finely and closely punctured, segments with long hairs, and with fine short apical ciliations. Legs clothed with black-brown hairs. Scopæ pale fulvous-brown. Length 13—16 mm.

Hab. Local but not rare in some places. Norwich and Chobham (spring brood); Norwich, Southwold, Bournemouth, Sidmouth, Shirley, and Windsor (autumn brood).

I have not the slightest doubt that these three so-called species are varieties of one. *Bimaculata* appears in April, and is taken, like most of the other spring bees, on sallows. *Decorata* and *vitrea* appear in August, and are taken on *Rubus*. The only character I know by which the autumn brood (*decorata*) can be known from the spring brood (*bimaculata*) is the paler pubescence of the face, and the want of the two spots on the 2nd abdominal segment beneath in the ♂, but as the ♀ differs greatly in both broods as to colour, the constancy in this respect of the ♂ of one brood does not seem to me sufficient for a specific character. I have sent specimens to Professor Perez, of Bordeaux, who tells me that

the species occurs there (also double-brooded), and that he has always considered them identical; *vitrea* is only a narrower form of the autumn brood; (for its affinities with *atriceps* see notes on preceding species).

Division III.

(6)	1.	♂; abdomen more or less red, or at least with the apical margins of the segments pale; in one species with the cheeks spinose or angulated at the base of the mandibles; mandibles simple; antennæ in some, reaching to the apex of the metathorax. ♀; abdomen more or less red at the base, or with the apical valve simple, not triangularly raised in the centre; segments with paler hairs at the apex; scopæ dark brown.	
(3)	2.	♂; antennæ short, not reaching beyond the scutellum. ♀; abdomen strongly punctured	*florea.*
(2)	3.	♂; antennæ reaching to the apex of metathorax. ♀; abdomen finely rugulose, not strongly punctured.	
(5)	4.	♂; apical ventral valve entire; cheeks simple. ♀; dorsal valve not punctured	*rosæ.*
(4)	5.	♂; apical ventral valve deeply emarginate; cheeks angulated or spinose. ♀; dorsal valve deeply punctured	*Trimmerana.*
(1)	6.	♂; abdomen without red or pale markings; antennæ not reaching to the apex of the metathorax; cheeks simple; mandibles often toothed at the base. ♀; abdomen without red markings, shining, polished, or densely clothed with long hairs, or, if with paler apical bands, then with the apical dorsal valve triangularly raised in the centre.	
(12)	7.	Species large; abdomen blue-black or deep black, polished and shining in both sexes; mandibles simple in ♂; tarsi, at least the basal joint, black; scopæ of ♀ black.	
(9)	8.	Abdomen blue-black	*cineraria.*
(8)	9.	Abdomen deep black.	
(11)	10.	Face and under side with black hairs	*thoracica.*
(10)	11.	Face and under side with white hairs	*nitida.*
(7)	12.	Species large or medium-sized; abdomen not polished and shining, except in some smaller species; mandibles often dentate in the ♂; scopæ of ♀ black, brown, or fulvous.	
(16)	13.	♂ with a narrow basal mandibular tooth, or with the 3rd joint of the antennæ as long as the 4th and 5th together. ♀; abdomen densely clothed with red or black hairs.	
(15)	14.	♂; mandibles toothed at the base. ♀; abdomen clothed with fulvous-red hairs	*fulva.*
(14)	15.	♂; mandibles simple. ♀; abdomen clothed with black hairs	*Clarkella.*

(13) 16. ♂; mandibles simple or with a wide triangular basal tooth; 3rd joint of the antennæ not nearly so long as the 4th and 5th together. ♀ with the abdomen not densely clothed either with red or black hairs.

(22) 17. ♂; mandibles simple; face clothed with black or brown hairs. ♀; scopæ fulvous or golden.

(21) 18. Posterior tibiæ in ♀ dark, with fulvous hairs.

(20) 19. Species large; face in ♂ with brown hairs, or mixed with black. ♀ with black mixed with brown .. .. *nigro-ænea.*

(19) 20. Species small; face in both sexes clothed with black hairs .. .. *Gwynana* and *bicolor.*

(18) 21. Posterior tibiæ in ♀ clear testaceous .. .. *angustior.*

(17) 22. ♂; mandibles toothed outwardly, or face with pale pubescence. ♀; scopæ brown or ochreous.

(26) 23. Face in ♂ with white hairs; mandibles with a large wide tooth at the base; hairs of the thorax in ♀ dull ochreous-brown; abdomen densely covered with ochreous-brown hairs.

(25) 24. Larger. ♂ with the mandibular tooth simply triangular. ♀ with the third antennal joint longer than the next two together .. .. *lapponica.*

(24) 25. Smaller. ♂ with the mandibular tooth wide and dilated, blunt at the apex. ♀ with the 3rd antennal joint only just as long as the next two together .. .. *præcox.*

(23) 26. Face in ♂ with pale hairs; mandibles with only a small basal tooth. ♀; hairs of thorax bright fulvous-brown; abdomen not densely hairy, or with fulvous-brown hairs at the base, and the apex black.

(28) 27. ♂; vertex of head subquadrate; mandibles only angulated at the base. ♀ with the hairs of the abdomen more or less white .. .. *helvola.*

(27) 28. ♂; vertex of head not subquadrate. ♀ without white hairs on the abdomen.

(30) 29. ♂ with the mandibular tooth shorter; 3rd submarginal cell less narrowed above. ♀; scopæ black-brown .. .. *varians.*

(29) 30. ♂ with the mandibular tooth longer; 3rd submarginal cell more narrowed above. ♀; scopæ fulvous-brown .. .. *fucata.*

8. *Andrena florea*, Fab.

Fab., Ent. Syst. ii., p. 308; Smith, Cat. Brit. Hym., 2nd ed., p. 30.

Head and thorax black, in the ♂ with ochreous hairs, in the ♀ with brownish hairs. Wings slightly dusky. Abdomen black, closely and distinctly punctured; 1st and 2nd segments more or less red at the apex. Scopæ of

♀ dark brown above. Antennæ of ♂ not reaching to the scutellum, 4th joint shorter than 3rd.

♂. Head and thorax clothed with ochreous hairs. Clypeus largely punctured. Antennæ short, not reaching to the scutellum, 4th joint not more than half as long as 3rd. Vertex punctured, rather quadrate. Mesothorax with its surface dull, very finely rugulose, distantly and finely punctured; metathorax finely rugose. Abdomen shining, subovate; 1st segment scarcely punctured, the following segments deeply and distinctly; segments narrowly impressed and testaceous at the apex; 1st and 2nd with a red apical band; apical segment clothed with short brown hairs. Abdomen beneath clothed with long pale hairs, segments with rather long apical fringes of golden ciliæ. Legs with brownish hairs.

♀. Larger and wider than the ♂. Head and thorax clothed with brown hairs; thorax more closely punctured than in the ♂; puncturation of the abdomen fine and deep, and closer than in the ♂, all the segments narrowly impressed and testaceous at the apex, the 1st and 2nd with a more or less extensive red apical band, 3rd and 4th with an apical line of golden hairs; anal fimbria brown-black; beneath punctured, segments with long apical fimbriæ. Femora and tibiæ beneath with pale hairs, scopæ on their outer surfaces and the tarsi clothed with dark black-brown hairs. Length 11—12 mm.

Hab. Not a common species; it occurs in June, and is very partial to the Bryony. I have taken it pretty freely at Chobham; it has also been taken at Highgate and Weybridge; Blackwater, Hants; Bideford and Ilfracombe, N. Devon.

The short antennæ of the ♂ and the punctured body of the ♀ will separate this species at once from *rosæ*; the dark scopæ and sculpture of the metathorax from *bimaculata*.

9. *Andrena rosæ*, Panz.

Panz., Faun. Germ., 74, 10.

= *austriaca*, Smith, Cat. Brit. Hym., 2nd ed., p. 27 (nec Panz. ?)

Black. Antennæ in the ♂ reaching to the 1st abdominal segment; both sexes with one or more of the

abdominal segments red at the apex. Abdomen of the ♀ very finely rugulose, not distinctly punctured; apical dorsal valve not punctured at the apex, and its margin not reflexed. Wings slightly brownish.

♂. Black; face sparingly clothed with brown hairs. Clypeus largely and deeply punctured, its anterior margin emarginate and somewhat reflexed. Antennæ reaching to the base of the abdomen, each joint of the flagellum curved. Vertex punctured, face above the antennæ finely strigose. Mesothorax shining, sparingly clothed with ochreous-brown hairs, clearly but not closely punctured; basal area of the metathorax finely rugose at the base, shining towards the apex, sides finely rugose and punctured, and clothed with long hairs. Abdomen shining, subelongate, clearly punctured, each segment with a narrow red or testaceous apical band, the 3rd and following segments with a line of pale hairs at the apex; 2nd with a few pale hairs on the disk; beneath sparsely punctured and clothed with long hairs, 3rd and following segments ciliated at the apex, apex of 8th segment entire. Legs clothed with pale brownish hairs; tarsi piceous.

♀. Head and thorax clothed with ochreous-brown or reddish brown hairs, those on the face above the antennæ darker. Mesothorax finely and sparsely punctured; metathorax as in the ♂. Abdomen ovate, very finely rugulose, but scarcely punctured, except on the 5th segment; 1st and 2nd segments more or less red at the apex, the sides of the 2nd also in the bright varieties red; the abdomen in some varieties is rather densely clothed with pale hairs, and all the segments bear distinct apical fringes, and are slightly punctured; in the brighter varieties there is generally less pubescence; anal fimbria dark brown; apical dorsal valve simple, and not punctured towards the apex. Abdomen beneath punctured, red at the base, clothed with long pale hairs. Legs clothed with dark brown hairs; femora and scopæ beneath with pale hairs. Length 11—13 mm.

Hab. This is a rare species. I took it last year at Bournemouth off *Rubus* in company with *bimaculata*, and it has occurred at Shirley, Reigate, Hastings, Ilfracombe, and Sidmouth.

Its nearest ally is *Trimmerana*, but the impunctate simple dorsal valve of the 6th segment in the ♀, and

the entire ventral valve of the 8th segment in the ♂, will distinguish it readily; at the same time I should not be surprised to find it some day admitted as the autumn brood of *Trimmerana*; (for its affinities with *florea* see that species).

I have reverted to the name *rosæ* for this species, as Panzer's figure of *austriaca* appears to be in no way like the ♂ here described, but to be probably that of *florea*.

10. *Andrena Trimmerana*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 116; Smith, Cat. Brit. Hym., 2nd ed., p. 46.

Var. *spinigera*, Kirby, Smith, &c. = *eximia*, Smith.

Stylopized var. = *picicornis*, Kirby, Smith, &c. = *picipes*, Kirby, Smith, &c.?

Thorax clothed with brown hairs; face in the ♂ either with black or brown hairs, in the ♀ with brown; cheeks at the base of the mandibles in the ♂ often spinose; base of the abdomen in either sex sometimes more or less red, apical dorsal valve of ♀ closely punctured, its margins slightly reflexed; apical ventral valve of ♂ deeply emarginate; scopæ of ♀ brown-black, pale beneath.

♂. Black; face densely clothed with brown hairs (*Trimmerana* true), or with longer black hairs (*spinigera*); cheeks at the base of the mandibles merely angulated (*Trimmerana*), or produced into a long spine (*spinigera*). Antennæ reaching to the apex of the metathorax, the joints arcuate. Mesothorax finely punctured, clothed with brown hairs; metathorax with its basal area finely rugose at the base. Abdomen very finely punctured, and clothed with long hairs, especially on the disk of the 1st and 2nd segments; apex of each segment narrowly impressed and testaceous, in some varieties with the whole of the 2nd, and part of the 1st and 3rd, red; beneath clothed with long hairs, apex of each segment ciliated, apex of the 8th largely and deeply emarginate. Legs clothed with brownish hairs.

♀. Head and thorax clothed with brown hairs, sculptured, &c., much as in the ♂, but without any spine on the cheek. Abdomen black, with the extreme apices of the segments piceous (*Trimmerana*), or with 1st, 2nd, and 3rd segments mere or less red (*spinigera*); each

segment with an apical band of paler hairs, although in the bright varieties the pubescence is much less abundant. Apical fimbria brown-black; apical dorsal valve strongly and closely punctured, its margins slightly reflexed; segments beneath clothed with short black hairs, and fringed with long pale apical hairs. Legs clothed with black-brown hairs; scopæ pale beneath. Length 10—15 mm.

Hab. Var. *Trimmerana* very common in the spring, April, &c., and generally distributed. Var. *Spinigera* rare; it has occurred, however, at Reigate, Canterbury, Ventnor, Exeter, Highgate, Tunbridge Wells, Hastings, Esher, Barham, &c.

Of this species there are certainly two distinct races, *Trimmerana* true and *spinigera*, and hitherto they have always been considered as species. Prof. Perez, however, considers them as only varieties, and I have quite come to the conclusion that he is right—the length of the spine on the cheek of the ♂ varies exceedingly, from a mere angular projection to a spine of one-tenth of an inch long. Last spring my brother sent me a lot of specimens from Canterbury; there were amongst them many ♀ *Trimmerana*, several ♂ *spinigera*, and two ♀ *spinigera*, but no ♂ *Trimmerana*; all these were caught off the same sallow. At Ventnor, in 1880, I took several ♂ *spinigera*, but no ♀, only ♀ *Trimmerana*. Here on Wandsworth Common I find ♂ and ♀ *Trimmerana* abundant. These facts are not, I know, conclusive, but the want of any structural character by which to distinguish the females of the two varieties apart, is, I think, a strong argument in favour of there being but one species, with a dimorphic ♂. F. Smith used to consider only the highly coloured females as *spinigera*; but I have intermediate varieties between them and the ordinary *Trimmerana* which, I think, no one could refer with certainty to either.

Picicornis is only a stylopized form of the above, and I believe I am right in referring *picipes* also to it.

11. *Andrena cineraria*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 575; Smith, Cat. Brit. Hym., 2nd ed., p. 33.

Blue-black; pubescence grey; scopæ of ♀ black; wings with an apical cloud.

♂. Head and thorax densely clothed with cinereous hairs, those of the face white. Antennæ reaching to the scutellum. Thorax with an indistinct transverse line of black hairs between the wings. Abdomen shining, blue-black; 2nd and following segments impressed along the apex; 1st segment, and 2nd segment as far as the apical impression, finely punctured and clothed with grey hairs; remaining segments punctured, except on their apical impressions, and clothed with short black hairs; sides and apex with a few long white hairs; segments beneath fringed with long white hairs; tibiæ clothed with black hairs.

♀. Face and thorax with greyish white hairs; a wide black central transverse band on the latter. Abdomen ovate, somewhat shining, blue-black, very finely punctured; apical fringe black. Legs densely clothed with black hairs, except the front femora, which are fringed with white hairs. Segments beneath fringed with black hairs, having a few white ones towards each side. Length 11—14 mm.

Hab. Not uncommon, and widely distributed. Abundantly distinct from all our other species.

12. *Andrena thoracica*, Fab.

Fab., Ent. Syst. ii., p. 328; Smith, Cat. Brit. Hym., 2nd ed., p. 34.

Head clothed with black hairs. Thorax with bright fulvous-brown hairs above, black beneath. Abdomen black, shining, clothed above and beneath, as also the legs, with black hairs.

♂. Vertex of the head rugosely punctured, and clothed along its posterior margin with brown hairs. Antennæ reaching to about the scutellum. Thorax rugosely punctured, but the hairs are so dense that it is difficult to see the actual surface. Abdomen very shining and finely punctured, the 2nd and following segments impressed along the apex; surface clothed with short black hairs; apex of abdomen and segments beneath fringed with long black hairs, segments impressed at the base. Legs with black hairs.

♀ only differs from the ♂ in the stout build and usual sexual characters, short antennæ, in having the 1st and 2nd abdominal segments glabrous and more finely punctured and the segments beneath not impressed at the base.

Legs and the scopæ densely clothed with black hairs. Length 13—16 mm.

Hab. Common but local, and variable in time of appearance. I have taken it in April and August.

13. *Andrena nitida*, Fourc.

Fourc., Ent. Par., No. 2; Smith, Cat. Brit. Hym., 2nd ed., p. 35.

Black; face clothed with whitish hairs. Thorax with bright fulvous-brown hairs above, with whitish hairs below. Abdomen shining in the ♂, clothed above with pale ochreous hairs; in the ♀ with a lateral patch of ochreous hairs on the 1st, 2nd, and 3rd segments, apical fimbria black; under side and legs in ♂, under side and femora only in ♀, clothed with pale hairs; posterior tibiæ and tarsi densely clothed with black hairs.

♂. Head rugosely punctured on the vertex; face clothed with whitish hairs, margined with black hairs along the eyes; vertex with a few fulvous hairs. Antennæ reaching to the scutellum. Thorax densely clothed with fulvous-brown hairs; mesothorax closely punctured; metathorax finely rugose. Abdomen elongate-ovate, shining, punctured, apex of each segment, except the 1st, rather widely impressed; surface sparingly clothed with pale hairs; beneath clothed with pale hairs, apical segment entire. Legs brownish black, clothed with pale hairs.

♀. Face clothed with short white hairs, those above the antennæ and along the eyes black, those on the vertex fulvous. Thorax as in the ♂, although the colour of the pubescence is brighter and richer. Abdomen widely ovate, black, shining, finely and clearly punctured, the 3rd and 4th segments at the base only; 1st, 2nd, and 3rd segments glabrous on the disk, but with a lateral patch of pale pubescence on each side; 4th with a few black hairs; apical fimbria black, densely clothing the 5th and 6th segments; apical dorsal valve punctured, its edges slightly raised; beneath punctured, clothed with long pale hairs, mixed with black. Femora clothed with long white hairs; intermediate and posterior tibiæ and tarsi with brownish black, posterior tibiæ with pale hairs beneath. Length 12—14 mm.

Hab. Very common in spring, and generally distributed. Could only be confounded with *thoracica*, from which the pale pubescence of the head and under side, and femora, &c., at once distinguish it.

14. *Andrena fulva*, Schrank.

Schrank., Enum. Ins. Austr., p. 400; Smith, Cat. Brit. Hym., 2nd ed., p. 38.

Face of ♂ with white hairs, of ♀ with black. ♂ mandibles very long and curved, toothed outwardly at the base. Thorax densely and abdomen more sparingly clothed with bright brown hairs. Posterior tarsi and extreme apex of tibiæ pale. ♀ entirely clothed with bright red hairs above; beneath and legs with black hairs. Wings clear in both sexes, recurrent nervure received near the apex of the 2nd submarginal cell.

♂. Black; head wide; face clothed with white hairs, mixed with pale brown hairs and a few black ones, vertex with pale brown hairs. Antennæ reaching to the scutellum. Mandibles very long, pointed, and curved, base outwardly with a sharp tooth, narrow at its base. Thorax densely clothed with bright brown hairs; basal area of metathorax very finely rugose. Abdomen elongate-oval, slightly shining, finely punctured, except towards the apices of the segments; clothed with golden brown hairs, which are longest on the 1st and 2nd segments; beneath sparsely punctured, apex of each segment with a fringe of long golden brown hairs, apical ventral segment truncate and testaceous at its apex. Legs clothed with golden brown hairs, posterior tarsi and the apical joints of the anterior and intermediate tarsi testaceous.

♀. Head densely clothed with black hairs. Thorax with bright, dark red hairs above, black beneath. Abdomen above rather paler as to its pubescence than the thorax, but very densely clothed with it; the apex of the 5th and the 6th segments clothed with black hairs; under side and legs clothed with black hairs; calcaria and apices of the tarsi pale testaceous. Length 12—14 mm.

Hab. Common in many places in the London district and elsewhere, but apparently local. The ♀ is unlike every other British bee; the ♂ resembles *Trimmerana* as much as any species, but the white hairs of the face and the tooth on the base of the mandibles will separate it at once.

15. *Andrena Clarkella*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 130; Smith, Cat. Brit. Hym., 2nd ed., p. 39.

Black; face in the ♂ clothed with pale brown hairs, in ♀ with black. 3rd joint of antennæ in ♂ equal to the 4th and 5th together. Thorax in both sexes clothed with brown hairs, which are of a brighter colour in the ♀. Abdomen sparingly clothed with short brownish hairs in the ♂, densely with black hairs in the ♀. Tarsi often pale in the ♂; posterior tibiæ and tarsi in the ♀ clear testaceous; scopæ golden; apical ventral valve of ♂ parallel-sided, rounded at the apex. Wings clear in both sexes, cloudy towards the apex, nervures pale; recurrent nervure received near the apex of the 2nd submarginal cell.

♂. Face clothed with pale brown hairs, margined with black along the eyes. Mandibles rather long, but not pointed, with a tooth close to the apex, base simple. Antennæ reaching to about the scutellum, 3rd joint very long, almost as long as the 4th and 5th together, 4th considerably shorter than 5th. Thorax clothed with brown hairs, intermixed with a few black ones on the sides of the metathorax and below the wings. Abdomen suboval, slightly shining, very finely and remotely punctured, and sparingly clothed with ochreous hairs, the posterior margins of the segments pale, apex clothed with pale golden hairs; beneath punctured, apex of each segment pale, and densely ciliated with short golden hairs; apical ventral valve parallel-sided, rounded at the apex. Legs clothed with pale golden hairs, apex of the posterior tibiæ and tarsi often testaceous.

♀. Head densely clothed with black hairs. Thorax above clothed with fulvous-brown hairs, beneath with black. Abdomen densely clothed with black hairs, in some varieties with a band of paler hairs on each segment; apical dorsal valve triangularly raised in the middle; under side and legs clothed with black hairs; posterior tibiæ and tarsi clear testaceous, clothed with golden hairs. Length 11—13 mm.

Hab. One of the very early spring bees, but not generally common. Norwich, Hampstead Heath, Hastings, Glanville's Wootton, Dorset, Scotland, &c.

The ♀ is quite distinct by its densely hairy black body from all the other species; the ♂ is most like that of *nigroænea*, but the long 3rd joint of the antennæ will

readily separate it from that species, as well as the position of the recurrent nervure in the 2nd submarginal cell, which in *nigrocænea* is received nearly in the middle.

16. *Andrena nigrocænea*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 109; Smith, Cat. Brit. Hym., 2nd ed., p. 45. Stylopised ♂ = *aprilina*, Smith.

Black, densely clothed with brown hairs. Face in ♂ with long brown hairs, or black hairs mixed with brown. Antennæ reaching to the post-scutellum. Abdomen shining; genitalia small; apical ventral valve entire; ♀, abdomen densely clothed with short hairs; apical fimbria black; dorsal valve flat, punctured; scopæ bright fulvous; tarsi with black-brown hairs. Wings clear, with testaceous nervures.

♂. Face densely clothed with black and brown hairs mixed, or brown in the centre surrounded with black; above the antennæ, between the eyes, longitudinally rugose. Antennæ reaching to the post-scutellum, its joints subarcuate; cheeks simple. Mesothorax, when seen through the dense brown hairs that clothe it, rugosely but not deeply punctured; metathorax finely rugose; basal area finely rugose throughout. Abdomen subovate, shining, finely punctured, and clothed densely on the first four segments with brown hairs, on the last three with black; apical margins of the 2nd and following segments shining and polished; beneath with the segments densely fringed with long hairs, apical valve truncate, entire; genitalia small. Legs clothed with fulvous-brown hairs.

♀. Pubescence of head and thorax as in the ♂, although that on the thorax is generally rather of a richer colour. Abdomen finely and closely punctured, and densely clothed with ochreous-brown hairs, often more or less fulvous on the first four segments, the pubescence at the apex of each segment rather paler; 5th and 6th segments clothed with black hairs; apical dorsal valve simple and punctured; beneath with the segments glabrous on their basal half, punctured and densely clothed with fulvous hairs on their apical half, and with a long apical fringe; anterior and intermediate legs clothed with brown hairs, posterior femora and

tibiæ with bright fulvous, tarsi with dark brown. Length 11—14 mm.

Hab. A common species in spring, April and May.

I do not think this species can well be confounded with others; it is most like *atriceps*, but the clear testaceous tibiæ of the ♀ in that species and the clathrate basal area of the metathorax in both sexes at once distinguish it; the bright fulvous scopæ separate the ♀ from that sex of *Trimmerana* and its allies, and the short antennæ the ♂. I have been able, through the kindness of Mr. C. W. Dale, to examine the type of *aprilina*, Smith, which is only a stylopised form of the ♂ of the above.

17. *Andrena Gwynana*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 120; Smith, Cat. Brit. Hym., 2nd ed., p. 40.

Black; face in both sexes densely clothed with black hairs; mandibles in ♂ simple. Thorax with ochreous-brown hairs in the ♂, dark fulvous-brown in the ♀. Abdomen finely punctured, shining, and unbanded in ♂; clothed with pale pubescence at the apex of the 1st, 2nd, and 3rd segments in ♀; scopæ fulvous; ♂, anal ventral valve rounded at the apex.

♂. Head about the width of the thorax or slightly wider, clothed with black hairs, largely punctured on the clypeus and face. Antennæ reaching to the scutellum. Thorax clothed with ochreous-brown hairs above, with black beneath; metathorax finely rugose. Abdomen shining, finely punctured, the segments much impressed at the apex, the impressions more shining and not punctured; basal segment and sides of the 2nd clothed with long pale hairs, the rest with short black ones; those at the apex of the abdomen brownish; beneath clothed with long black hairs; pubescence of the legs of the same colour as that on the thorax.

♀. Head densely clothed with black hairs; punctured as in the ♂. Thorax densely clothed with bright fulvous-brown hairs above, black beneath. Abdomen very finely rugulose, shining, and very finely punctured; 1st and 2nd segments clothed with pale fulvous hairs, 3rd and following with black hairs, 3rd at the apex with pale fulvous; anal dorsal valve punctured, its centre triangularly raised; beneath with the apex of each segment

punctured and clothed with long black hairs, and also having a slight central depression noticeable only in certain positions. Legs clothed with black hairs: posterior femora beneath, and scopæ with bright fulvous hairs; tarsi with brown-black hairs. Length 9—11 mm.

Hab. A common species in spring, and generally distributed.

The only species with which it is likely to be confounded is the following, as the black-haired face and simple mandibles of the ♂, and the fulvous scopæ of the ♀ distinguish it from the other small species of this group.

18. *Andrena bicolor*, Fab.

Fab., Syst. Ent., p. 376; Smith, Cat. Brit. Hym., 2nd ed., p. 41.

Differs only from *Gwynana* in the following points:—

The ♂ has the abdomen more strongly punctured and rather less hairy, and the apical ventral valve pale and more truncate, sometimes emarginate, at the apex; the pubescence paler.

The ♀ is rather smaller, with the apical fimbria pale brown, the abdomen rather more punctured, and the pubescence beneath pale, not black. Length 9—10 mm.

Hab. This species occurs in July and August. I have taken it at Hastings, Chobham, Southwold, and Littlehampton. F. Smith says that it frequents the flowers of the mallow. I fancy that it is only the second brood of *Gwynana*, but the ♂ certainly is distinct by its much stronger puncturation.

19. *Andrena angustior*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 122; Smith, Cat. Brit. Hym., 2nd ed., p. 52.

♀. Very like *bicolor* in many respects, but differing in the slightly longer, clear testaceous posterior tibiæ; the face clothed with pale ochreous hairs; thorax with fulvous hairs; abdomen finely rugulose, the segments widely impressed and pale at the apex; dorsal apical valve smooth, its centre raised, but not triangularly; apical fimbria brown; scopæ golden.

I do not know the ♂, and F. Smith's description does not give any characters to distinguish it from its allies.

Hab. Hampstead, Norwich, &c.; appears in May.

20. *Andrena lapponica*, Zett.

Zett., Ins. Lapp., p. 460; Smith, Cat. Brit. Hym., 2nd ed., p. 49 = *apicatus*, Sm., Zool. v., p. 1748.

Black: clothed in the ♂ with griseous-brown, in the ♀ with ochreous-brown hairs; face in the ♂ with white hairs; mandibles produced outwardly into a triangular tooth at the base. Abdomen shining, first two segments covered with grey hairs. ♀, abdomen dull, clothed with long hairs; apical dorsal valve raised in a triangular form in the middle; scopæ brown.

♂. Black; face clothed with long white hairs, surrounded with black hairs on the sides and vertex; mandibles long, armed at the base outwardly with a triangular tooth. Antennæ reaching to about the scutellum, 3rd joint very narrow at the base. Thorax clothed with brownish grey hairs, paler round the edges; mesothorax dull, very finely and distinctly punctured; metathorax finely rugose at the sides, basal area dull and smoother. Abdomen shining, subelongate; 1st and 2nd segments clothed with grey hairs; 3rd, 4th, and 5th with only a few scattered hairs; 6th and 7th clothed with golden brown hairs; segments beneath punctured, except at their bases, posterior margins ciliated. Legs clothed with grey hairs; apical ventral segment rounded at the apex.

♀. Very like that of *Trimmerana*, but differing in the following characters:—Antennæ decidedly shorter, 3rd joint longer than the next two taken together, much narrowed towards the base; pubescence longer, paler, and not forming such regular apical bands on the abdomen; 2nd submarginal cell of the front wings with the recurrent nervure received nearer the apex than in *Trimmerana*; apical dorsal valve not flat and punctured as in that species, but triangularly raised in the centre, its margins widely depressed. Legs with the pubescence decidedly lighter, of a pale brown; femora and hind tibiæ internally clothed with pale ochreous hairs; beneath, the floccus of the hind femora is very much larger and longer, and the abdomen much more densely covered with hairs; 2nd, 3rd, and 4th segments without the transverse basal line observable in *Trimmerana*. Length 12—15 mm.

Hab. This species has hitherto been rare in England, but it has occurred at Moffat and at Bristol; and I took

several females last spring, and this spring, off sallows at Hastings, in April. I suspect it is sometimes overlooked for *Trimmerana*, from which it is, however, structurally abundantly distinct. The ♂ closely resembles that of *præcox*, but its entire 8th abdominal segment, which is rounded at the apex, its larger size, and much less developed mandibular tooth will at once distinguish it. The 3rd joint of the antennæ in both sexes, with its very narrow base, is a peculiar character in this species.

21. *Andrena præcox*, Scop.

Scop., Ent. Carn., p. 301. *Smithella*, Kirby, Smith, Cat. Brit. Hym., 2nd ed., p. 48.

Face of the ♂ above the clypeus with black hairs; clypeus clothed with white; mandibles with a very large, wide, triangular tooth at the base outwardly; apical ventral segment emarginate; pubescence obscure ochreous-brown; tarsi piceous. ♀, upper surface of the insect entirely covered with ochreous-brown hairs; rather brighter on the thorax; apical fimbria brown; scopæ ochreous-brown.

♂. Black; head finely and longitudinally rugose above the antennæ; face above the clypeus clothed with black hairs, clypeus itself with white; sides of the face and clypeus strongly and largely punctured; mandibles long and curved, produced at the base outwardly into a large, triangular, flat tooth, blunt at the apex. Antennæ reaching to the post-scutellum; 3rd and 5th joints subequal in length, 4th rather shorter; vertex of the head deeply emarginate behind; the cheeks much produced and angulated behind the eyes. Mesothorax dull, very finely rugulose, clothed with obscure brown hairs; basal area of metathorax very finely rugulose, sides punctured and rugulose. Abdomen rather shining, sparsely clothed on the basal segment and the base of the 2nd with long ochreous hairs, on the following with short hairs, apex with long pale ochreous hairs; beneath with long hairs, and the segments with golden apical ciliations, apical ventral segment pale at the apex and emarginate. Legs clothed with greyish brown hairs; tarsi piceous.

♀. Face clothed with obscure ochreous-grey hairs mixed with a few black ones; the clypeus finely rugulose and largely punctured, its anterior margin emarginate, but with its angles not produced; 3rd joint

of the antennæ about equal in length to the 4th and 5th together. Thorax and abdomen densely clothed with pale ochreous-brown hairs. Apical fimbria black-brown; apical dorsal valve punctured, triangularly raised in the centre; segments beneath punctured at the apex, and clothed with long pale hairs. Legs brown, clothed with pale brown hairs. Length 8—10 mm.

Hab. Appears in April, and is not a rare species in many places; Hastings, Canterbury, Chobham, Weybridge, Wimbledon, Norwich, &c.

The ♂ is abundantly distinct by the obscure colour of the pubescence, and the large dilated tooth at the base of the mandibles; the ♀ is like a diminutive *lapponica*, but the shorter, stouter, 3rd joint of the antennæ, only equal to the next two joints in length, will distinguish it structurally.

22. *Andrena varians*, Rossi.

Rossi, Mant. Ins., p. 317; Smith, Cat. Brit. Hym., 2nd ed., p. 43.

Face in the ♂ with pale hairs. Mandibles at the base produced and angulated; ♀, face with black hairs. Thorax in both sexes with bright brown hairs. Abdomen in ♂ shining, two basal segments with a few long hairs; tarsi piceous. ♀; two basal segments clothed with bright brown hairs, the rest with black. Scopæ black-brown; hairs beneath black. Wings clear, nervures pale, apex slightly clouded.

♂. Face above the clypeus clothed with pale brownish hairs, clypeus itself with white. Mandibles at the base outwardly with a triangular tooth. Antennæ reaching to the metathorax; 3rd joint slightly longer than the 4th; 4th slightly shorter than the 5th. Vertex of the head deeply emarginate posteriorly, but not so quadrate as in the following. Mesothorax dull, very finely rugulose, clothed with bright brown hairs. Metathorax with rather paler hairs. Abdomen shining, elongate-oval; 1st and 2nd segments sparsely clothed with a few long pale hairs; the 3rd and 4th on the disk with short black hairs, at the sides with longer pale ones; 6th and 7th with pale golden hairs; beneath with the apices of the segments pale testaceous, and clothed with long pale hairs. Apical ventral valve more or less rounded at its

extremity. Legs clothed with pale hairs; tarsi testaceous.

♀. Face densely clothed with black hairs. Clypeus strongly punctured, its anterior margin smooth, rather reflexed, and slightly produced at the lateral angles. Antennæ with the 3rd joint longer than the 4th and 5th together; 6th slightly longer than 5th; 5th slightly longer than 4th. Thorax densely covered with bright fulvous-brown hairs. Abdomen with fulvous hairs on the 1st segment and on the disk of the 2nd; the rest of the abdomen above and below clothed with black hairs; 6th segment with its dorsal valve punctured, triangularly raised in the middle. Legs clothed with dark brown hairs; posterior femora, floccus, and scopæ beneath with pale hairs. Length 9—11 mm.

Hab. A common species in April and May.

I have followed Smith, 1st edition 'Brit. Bees,' in my selection of a ♂ for this species. In the 2nd edition he has reversed the views he held there, but I find that Schenck and Dours both agree with him in his former identification, and give the smaller-headed ♂ with the basal tooth to the mandibles to *varians*. Thomson, on the other hand, gives it to *helvola*, making a third species, *angulosa*. My own firm belief is that they are all varieties of one species, and, if Smith's observations are correct, they quite bear out this view, as in his 1st edition he says that he describes from a pair of *varians* taken *in coitu*, giving the ♂ here described to *varians*; in the 2nd edition he exactly reverses the males, and yet he again observes that he is contrasting males that he has taken *in coitu*.

23. *Andrena helvola*, Linn.

Linn., Syst. Nat., ed. x., vol. i., p. 575; Smith, Cat. Brit. Hym., 2nd ed., p. 42.

Whether this is distinct from the preceding or not has been more or less a question with most authors. The males certainly are different in appearance, but they are different only in characters which might be the result of development, the ♀ only in colour. Such characters as I am able to detect I give below.

♂. Differs from that of *varians* in the larger, more quadrate, vertex of the head, the lateral angles of which

are accordingly more produced backwards and farther from the back of the eye; the mandibles are simple at the base, and not produced into an angular tooth; the abdomen is rather wider and more pubescent, its surface less shining, and more distinctly, though exceedingly finely, rugulose; lastly, the apical ventral segment is truncate at its extremity. These may seem to be good characters, still they all tend to vary in a long series. The most characteristic are doubtless the large head and simple mandibles, as in most cases where development of the head takes place a character such as the basal mandibular tooth would be developed too, whereas here the reverse takes place, and the simple mandibles are with the large-headed form.

♀. Only differs, so far as I know, by the white pubescence on the abdomen and face, which takes the place of the black in *varians*; still, however, the white is often mixed with the black, sometimes more and sometimes less. I have one specimen which has no black hairs on the abdomen at all, except on the two apical segments, and taken alone it would stand as a really good species. I have others with white hairs at the apex of each segment, mixing with black towards the base; others again with only indications of white pubescence, and this tendency to vary, unaccompanied, so far as I can see, by any structural character, makes me very doubtful as to the distinctness of the species.

24. *Andrena fucata*, Smith.

Smith, Zool. v., p. 1743; Cat. Brit. Hym., 2nd ed., p. 54 = *clypearis*, Nyl.

This species is also closely allied to *varians* and *helvola*, but the fulvous scopæ of the ♀ and the more strongly dentate mandibles of the ♂ will serve to distinguish it.

♂. The other characters which are worth notice are its slightly longer antennæ, the longer pubescence of the face, the shape of the 3rd submarginal cell in the fore wings, which is more narrowed above, its upper margin not being nearly half as long as its lower, and the position of the recurrent nervures, which are received slightly nearer the apices of the 2nd and 3rd submarginal than in the allied species. Apical ventral valve testaceous, and rounded at the extremity.

♀. Face clothed with white hairs, inclining to

fulvous towards the vertex; clypeus strongly punctured; anterior margin raised and shining, with the angles produced and more prominent than in the preceding species. Thorax clothed with bright brown hairs above, and white hairs beneath and at the sides of the metathorax. Abdomen nearly dull, its surface very finely rugulose; basal segment and base of the 2nd with a few long pale hairs; following segments almost naked, with a few short pale hairs at the base and sides; apical fimbria brown; segments beneath fringed with very pale fulvous hairs. Legs with the femora clothed with white hairs, floccus white; tibiæ of anterior and intermediate pairs with short brown hairs, scopæ pale fulvous; tarsi piceous, clothed with brown hairs. Length 9—11 mm.

Hab. Not common. Chobham (June); Charlwood, near Reigate; Wakefield, Yorkshire (June); Bristol, and Scotland.

Division IV.

(2) 1. ♂; abdomen testaceous at the base; tibiæ testaceous. ♀; tibiæ clear testaceous .. .. *ferox*.
(1) 2. ♂; abdomen not testaceous at the base; tibiæ pale only at the apex. ♀; tibiæ dark .. *bucephala*.

25. *Andrena ferox*, Smith.

Smith, Zool. v., p. 1670; Cat. Brit. Hym., 2nd ed., p. 32.

Black; head very large in the ♂; mandibles acutely spined at the base; base of abdomen more or less testaceous; ♀ with the apical fimbria fulvous-brown; posterior tibiæ clear testaceous; scopæ bright golden yellow. Wings slightly dusky, nervures pale.

♂. Head and thorax clothed with pale yellowish hairs, disk of latter nearly naked. Head very large; antennæ reaching to the metathorax; mandibles angulated outwardly at the base and spinose in some specimens (*fide* Smith). Abdomen very shining; apex of the 1st and 2nd segments, and sometimes the base of the 2nd and 3rd, widely testaceous; apex with pale golden hairs. Legs clothed with golden hairs, with the posterior tibiæ, and the apices of the others and all the tarsi, pale testaceous.

♀. Black. Head and thorax clothed with brown hairs; mandibles very wide at the base, their lower

margins produced into a membranous sort of wing; clypeus rugosely punctured, with a smooth raised dorsal line. Mesothorax almost naked in the centre, dull, finely and irregularly punctured. Scutellum rather shining and more strongly punctured. Abdomen dull, the apical margins of the segments testaceous, and fringed with short golden hairs at the sides; apical fimbria brownish; beneath punctured, apices of the segments pale, and fringed with long pale hairs. Legs piceous, clothed with golden hairs; posterior tibiæ and tarsi clear testaceous-yellow, clothed with pale golden hairs. Length 9—12 mm.

Hab. Very rare. The only recorded localities for it are Bristol, Windsor, and Hastings.

This is a very distinct species, the pale legs of the ♂ and the clear testaceous posterior tibiæ of the ♀ distinguishing it at once from its nearest ally, *bucephala*.

26. *Andrena bucephala*, Steph.

Steph., Ill. Brit. Ent. Suppl. 17, pl. xliii., f. 4, ♂; Smith, Cat. Brit. Hym., 2nd ed., p. 61.

Black. Head in the ♂ very large; mandibles simple. Thorax clothed with brown hairs. Abdomen shining; apical ventral segment deeply emarginate at the apex; apex of tibiæ and all the tarsi testaceous; ♀ black; segments of abdomen narrowly pale and fringed with white hairs; apical fimbria brown; posterior tibiæ and tarsi piceous, clothed with golden hairs.

♂. Head very large, sometimes nearly twice as wide as the thorax; clypeus shining and punctured, clothed with long hairs at the sides; mandibles long and falcate, piceous at the tips. Antennæ reaching to the apex of the metathorax; 3rd joint shorter than the two following together; 4th and 5th subequal. Thorax clothed with bright brown hairs; metathorax with the basal area narrow and smooth at each side. Abdomen shining, the apex of each segment rather widely testaceous; apical ventral segment narrow, rather widened at the apex, and deeply emarginate. Legs clothed with pale hairs; apices of the tibiæ and the tarsi testaceous.

♀. Head clothed sparingly with pale hairs; clypeus largely punctured, with a smooth dorsal line; antennæ rather long, reaching to the metathorax; lateral

impressions on the inner margins of the eyes filled with golden velvety hairs. Thorax clothed with pale hairs round the edges, and with fulvous hairs on the disk. Scutellum, post-scutellum, and basal area of metathorax longitudinally impressed down the centre. Abdomen somewhat dull, clothed with a very short pale pubescence; apical margins of the segments pale, narrowly fringed with white hairs; apical fimbria golden brown; beneath punctured, the posterior margins of the segments pale and fringed with long hairs. Legs clothed with pale hairs; posterior tibiæ and all the tarsi piceous, translucent; tibiæ and tarsi narrower than in most of the species, giving them an unusually elongate appearance. Length 9—12 mm.

Hab. Local. Hampstead, Bristol, Chobham Common.

Division V.

(10) 1. ♂; labrum tuberculated, the tubercle much raised and emarginate in front. ♀; scopæ black, dull brownish, or reddish brown.

(9) 2. ♂; abdomen densely covered with pale hairs; mandibles not long and falcate. ♀; disk of thorax densely clothed with pale or bright fulvous hairs.

(6) 3. ♂; apical ventral segment bilobed at the apex. ♀; 5th abdominal segment clothed with erect black hairs.

(5) 4. ♀ with dense black scopæ; face with black pubescence .. .. *nigriceps.*

(4) 5. ♀ with brown scopæ; face with pale pubescence *simillima.*

(3) 6. ♂; apical ventral valve entire at the apex. ♀; 5th abdominal segment with adpressed brown-black hairs, or pale hairs.

(8) 7. ♂; larger; abdomen less distinctly banded; apical ventral segment slightly dilated and subtruncate at the extremity. ♀; 5th abdominal segment with pale hairs .. .. .. *tridentata.*

(7) 8. ♂; smaller; abdomen more distinctly banded; apical ventral segment not dilated, rounded at the extremity. ♀; 5th abdominal segment with dark hairs .. .. *fuscipes.*

(2) 9. Hairs on disk of thorax black or nearly so. ♂; mandibles long and falcate; segments of abdomen with only pale apical bands .. .. *denticulata.*

(1) 10. ♂; tubercle of labrum transverse, simple. ♀; scopæ bright fulvous yellow.

(12) 11. Pubescence of the face below the antennæ white in both sexes .. .. *fasciata.*

(11) 12. Pubescence of the face below the antennæ pale brown in both sexes .. .. *fulvicrus.*

27. *Andrena nigriceps*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 134, ♀ (nec ♂); Smith, Cat. Brit. Hym., 2nd ed., p. 50, ♀ (nec ♂).

Black. Face and under side in ♂ with whitish, in ♀ with black, hairs. Thorax with bright fulvous hairs. Abdomen with wide apical bands of fulvous hairs, the bands of the 3rd and 4th segments in the ♂ paler; anal fimbria in ♀ black. Legs with pale hairs in ♂, black in ♀. Apical ventral valve of ♂ deeply emarginate. Wings clear; nervures piceous.

♂. Head as wide as the thorax or wider, closely punctured, more or less shining on the vertex and behind the eyes; clypeus emarginate; labrum tuberculated, hairy at the sides, the tubercle emarginate in front; face clothed with nearly white hairs on the clypeus, and with very pale fulvous hairs above it. Antennæ not quite reaching to the scutellum; 3rd joint about once and a half as long as the 4th; 4th slightly shorter than 5th. Mesothorax clothed with bright fulvous hairs, largely and deeply punctured and shining on the disk, closely and finely round the edges. Scutellum shining at the base, punctured at the apex, with an irregular dorsal line of punctures. Metathorax dull, finely rugose, the sides of the basal area indicated by a smoother, somewhat shining, line. Abdomen dull, punctured; 1st and 2nd segments almost entirely clothed with fulvous hairs; 3rd and 4th segments clothed with paler shorter hairs, and with a distinct pale apical band; 5th and 6th segments with black hairs at the base, pale at the apex; apical fimbria brown; beneath punctured; the segments with long white apical fringes; apical ventral segment deeply emarginate and testaceous at the apex. Legs clothed with pale hairs; tarsi piceous at the apex.

♀. Face densely clothed with black hairs. Clypeus rugosely punctured. Vertex with fulvous-brown hairs. Thorax densely clothed with fulvous-brown hairs above, with black below; sculptured as in the ♂. Abdomen dull, punctured; 1st and 2nd segments almost entirely clothed with pale fulvous hairs; the 3rd and 4th with black hairs at the base, with fulvous hairs at the apex, forming a wide apical fascia; 5th and 6th clothed with black hairs; apical dorsal valve not punctured, impressed at the sides; beneath punctured, clothed with sooty black hairs. Legs densely covered with black

hairs ; tarsi piceous at the apex ; calcaria pale. Length 11—12 mm.

Hab. Rare. Southwold, Lowestoft, Norwich, Deal, Bournemouth, Ilfracombe, &c.

28. *Andrena simillima*, Smith.

Smith, List of Brit. Anim. Coll. B. M., pt. vi., App., p. 122 ; Cat. Brit. Hym., 2nd ed., p. 50.

"♂. Black ; the face clothed with pale pubescence ; that on the clypeus anteriorly is white, its anterior margin emarginate, the lateral angles produced into sharp teeth ; the labrum bidentate. Mandibles forcipate, their tips ferruginous. Antennæ not quite as long as the thorax. Thorax clothed above thinly with fulvous pubescence, beneath it is white. Wings as in ♀. Abdomen ovate-lanceolate, the segments thinly fringed with pale pubescence ; the apex fulvous."

I do not know the ♂, so have copied F. Smith's description.

♀. Very like *nigriceps*, but rather smaller, the face and under side clothed with pale fulvous hairs, and the 3rd and 4th segments of the abdomen without such deep black hairs on their basal half. Legs clothed with paler hairs than in that species. From *pubescens* it differs at once by the simple impunctate apical dorsal valve, and the deep black suberect pubescence of the 5th segment. Length 9—10 mm.

Hab. Rare. Kingsdown, near Deal ; Isle of Wight, Bournemouth, &c.

29. *Andrena denticulata*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 133 : Smith, Cat. Brit. Hym., 2nd ed., p. 53 = *Listerella*, Kirby.

Black. Face clothed with pale brownish white hairs. Mandibles of ♂ long and falcate. Thorax in both sexes sparingly clothed on the disk with black-brown hairs, and with pale hairs at the sides. Segments of the abdomen with pale apical bands. Scopæ of ♀ reddish brown. Wings somewhat dusky, especially at the apex.

♂. Head wider than the thorax ; face clothed with

pale brownish hairs; labrum tuberculated, the tubercle deeply sulcate down the middle; mandibles long and falcate; cheeks with a slight angle at the base of the mandibles; antennæ not reaching to the scutellum; vertex shining, irregularly punctured, quadrately produced behind the eyes, its posterior margin deeply emarginate. Mesothorax dull, finely punctured, clothed on the disk sparingly with black-brown hairs, on the sides with paler hairs. Scutellum shining, remotely punctured. Metathorax finely rugose, clothed with long pale hairs. Abdomen subelliptic; basal segment with long scattered pale hairs; 2nd with a band of short pale hairs at the apex on each side, and a few long scattered hairs on the disk; 3rd and 4th with an entire apical band; the base of the 2nd, 3rd, and 4th segments clothed with erect black-brown hairs, and the 5th and following segments entirely so clothed; beneath 2nd to 5th segments with long pale apical fringes; apical valve rounded at apex. Legs piceous; tibiæ and tarsi with reddish brown hairs, tarsi testaceous.

♀. Rather like the ♂, but with the head less quadrate on the vertex; the thorax clothed as in that sex. Abdomen dull, elliptic; basal segment and disk of the 2nd with long scattered hairs; apex of the 2nd, 3rd, and 4th with an entire band of decumbent whitish hairs; the disk of these segments with short black hairs; 5th at the apex with sooty hairs; 6th clothed with nearly black hairs; apical dorsal valve punctured, flat, with its margins reflexed; beneath with long pale hairs. Legs: femora with pale hairs; tibiæ and tarsi with red-brown hairs, those of the scopæ rather duller, those of the tarsi brighter, tarsi piceous. Length 9—11 mm.

Hab. Not uncommon. Chobham, Bournemouth, Carlisle, Southend. F. Smith says he has taken it on Bryony; I have taken it myself on *Senecio* and thistle-heads. It is a very distinct species, and I do not think it can be confounded with any other.

30. *Andrena fuscipes*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 136 = *pubescens*, Kirby; Smith, Cat. Brit. Hym., 2nd ed., p. 51.

Black. Head and thorax clothed with fulvous hairs, often almost grey in the ♂. Abdomen in the ♂ densely

covered with hairs, with paler bands at the apex of the segments; apical ventral segment rounded at the apex, in ♀ with five pale pubescent bands; 5th and 6th segments with black-brown hairs. Legs with brown hairs.

♂. Face deeply punctured and clothed with long pale fulvous hairs. Vertex behind the eyes shining and sparingly punctured. Labrum tuberculated, sulcate in front. Antennæ reaching to the base of the metathorax. Mesothorax and scutellum shining, largely punctured, clothed with pale fulvous hairs. Metathorax finely rugose. Abdomen with the posterior margins of the segments narrowly testaceous, densely clothed with pale fulvous hairs, becoming quite grey after exposure, and forming a distinct wide band at the apex of each segment; pubescence of 6th and 7th segments pale; beneath with pale apical margins to the segments and long pale hairs; apical ventral valve rounded and testaceous at the apex. Legs clothed with pale hairs; tarsi testaceous.

♀. Face sparingly clothed with pale fulvous hairs on the sides; clypeus largely punctured, orbital impressions filled with brown velvety pubescence. Antennæ pale beneath towards the apex. Thorax clothed with rather bright pale fulvous hairs; mesothorax dull, punctured; scutellum shining, largely and irregularly punctured; metathorax finely rugose. Wings with a slight apical cloud; nervures dark piceous. Abdomen: 1st segment clothed with long fulvous hairs, and with an apical band of rather paler hairs; 2nd, 3rd, and 4th segments with a short pale erect pubescence at the base, and with a wide apical band of decumbent pale hairs; 5th and 6th segments clothed with decumbent brown hairs; apical dorsal valve finely punctured and triangularly raised in the middle; beneath punctured and clothed with long hairs on the apical portions of the segments. Femora clothed with pale hairs, floccus large and pale; tibiæ and tarsi clothed with brown hairs, paler on their under sides, tarsi testaceous. Length 9—10 mm.

Hab. Common on *Erica*, &c., in heathy localities, in July and August. The pubescence fades very much on exposure. It is easily distinguished from either of the preceding by the decumbent hairs of the 6th segment; in the other two the hairs are suberect, and form a projecting fringe.

31. *Andrena tridentata*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 132; Smith, Cat. Brit. Hym., 2nd ed., p. 52.

Black; clothed with pale fulvous pubescence. ♂ with the ventral apical valve entire and somewhat truncate; ♀ with the apical fringe pale; the hairs on the extreme apex of the 5th segment and those on the 6th reddish golden. Scopæ very pale fulvous.

♂. Very like that of *fuscipes*, but larger, the abdomen more hairy, the hairs longer and not forming such distinct apical bands, the apical ventral segment wider at the apex and more truncate.

♀. Differs from *fuscipes* in the paler colour of the pubescence, in having the antennæ with the apical joints entirely pale, the 5th abdominal segment with pale hairs slightly golden at the apex, and the 6th with reddish gold hairs; pubescence of the legs paler, that of the scopæ being pale whitish, with a slightly fulvous tint, that of the tarsi pale cinnamon-brown; tarsi testaceous. Length 10—11 mm.

Hab. Very rare, especially the ♀. Southwold; Norwich; Cromer; Bournemouth; Christchurch, Hants. Occurs on the ragwort.

32. *Andrena fulvicrus*, Kirby.

Kirby, Mon. Ap. Angl. ii., p. 138; Smith, Cat. Brit. Hym., 2nd ed., p. 57.

Face in the ♂ clothed with long brown hairs mixed with black; of ♀ with brown hairs. Thorax with brown hairs in both sexes. Abdomen in the ♂ clothed with pale ochreous hairs, each segment with an apical band of ochreous hairs, hairs of apical segment brown. ♀; abdomen clearly and closely punctured, first four segments with an apical band of very pale fulvous pubescence, sometimes white; apical fimbria long and black. Scopæ golden.

♂. Face densely clothed with brown hairs surrounded with black; labrum without the raised sulcate tubercle observable in the foregoing species. Vertex dull, punctured. Antennæ not reaching to the scutellum. Mesothorax dull, punctured, clothed with obscure brownish hairs. Metathorax rugose, hairy all over like the

mesothorax. Abdomen slightly shining, finely and rugosely punctured, clothed with pale hairs on the first two segments, and with black hairs on the remainder; each segment to the 5th with an apical band of pale ochreous hairs; 6th and 7th segments entirely clothed with brown hairs; beneath clothed with long pale hairs; apical ventral valve rounded at the apex, and slightly and narrowly emarginate in the centre. Legs clothed with ochreous hairs; tarsi piceous.

♀. Face clothed with fulvous-brown hairs. Vertex with black-brown; mesothorax dull, closely punctured, clothed with dusky brown hairs on the disk, and with fulvous-brown hairs round the sides. Scutellum rather shining, and remotely punctured. Metathorax finely rugose, clothed with long fulvous-brown hairs. Abdomen finely and very closely punctured, the puncturation of the basal segment rather less close than that of the following; the 1st to the 4th segments with an apical band of pale fulvous hairs fading to white, that on the 1st often wanting; 5th and 6th with long black hairs; apical valve punctured, its margin very slightly and narrowly reflexed; segments beneath fringed at the apex with bright fulvous hairs. Legs, especially the posterior tibiæ, clothed with bright fulvous hairs. Length 10—12 mm.

Hab. A very common species; it appears in April, and again sometimes in August. *Extricata*, Smith, is only a variety with white bands, and is quite distinct from the following, although often regarded as the same by continental authors.

33. *Andrena fasciata*, Nyl.

Nyl., (Revisio), Not. Salls. Faun. Flor. Fenn., Förh. ii., p. 256.

Very like the preceding, but differing in the following particulars:—

The pubescence of the face in both sexes is white, also that of the under side of the thorax and femora; the abdomen in the ♂ is clothed with rather longer pubescence than in *fulvicrus*, and the apical bands are formed of longer less decumbent hairs; the puncturation also is more distinct, and the genitalia lack the notch-like sinuation on the outer margin near the apex observable in *fulvicrus*. The ♀ has the abdomen rather more

closely punctured than in *fulvicrus* on the basal segment, the apex of which has a pale fulvous band, often nearly or quite white; the next three segments have pure white bands, composed of rather longer and less closely adpressed hairs than in that species; beneath clothed with white hairs; scopæ bright golden fulvous. Length 10—12 mm.

Hab. Rare; has occurred at Hastings, Tunbridge Wells, and Canterbury; it appears in April.

Division VI.

(4)	1.	Legs entirely black in both sexes; ♂, clypeus not white; ♀, abdominal bands very narrowly interrupted; scopæ dull greyish brown.	
(3)	2.	Abdomen distinctly punctured	*argentata.*
(2)	3.	Abdomen not punctured	*albicrus.*
(1)	4.	Legs in both sexes with the tibiæ or tarsi more or less pale. ♀, abdominal bands, when present, widely interrupted. ♂, clypeus white in some species.	
(12)	5.	♂, clypeus white; or if black, then with distinct white apical lines of pubescence at the sides of the 2nd, 3rd, and 4th abdominal segments. ♀, abdomen with distinct lateral streaks or bands.	
(7)	6.	♂, clypeus white; mesothorax densely clothed with fulvous-brown hairs; tibiæ more or less testaceous. ♀, anal fringe bright golden; wings brownish, their nervures pale testaceous	*chrysosceles.*
(6)	7.	♂, clypeus white, or sometimes black; mesothorax with only a sparse greyish pubescence; tibiæ black. ♀, anal fringe dull; wings with dark piceous nervures.	
(9)	8.	♂, clypeus only white. ♀, tibiæ of posterior legs testaceous	*analis.*
(8)	9.	♂, clypeus black, or clypeus and sides of the face also white. ♀, posterior tibiæ black.	
(11)	10.	♂, clypeus black; tarsi testaceous. ♀, scutellum scarcely punctured	*lucens.*
(10)	11.	♂, clypeus and side of face white. ♀, scutellum densely punctured	*coitana.*
(5)	12.	Clypeus black in both sexes; abdomen without white pubescent bands or lateral streaks.	
(14)	13.	Smaller, rather coarsely punctured	*fulvago.*
(13)	14.	Larger, finely and closely punctured	*polita.*

34. *Andrena albicrus*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 156; Smith, Cat. Brit. Hym., 2nd ed., p. 61.

Black; face, under side, and legs in the ♂ clothed with silvery hairs. Thorax above with very pale fulvous hairs, darker on the scutellum and the posterior portion of the mesothorax. ♀ with the face and thorax clothed with fulvous hairs, paler beneath. Abdomen in both sexes shining, rather flat, elliptic in ♂, ovate in ♀, without definite punctures, and clothed with long pale hairs; each segment with an interrupted apical band of pale hairs. Scopæ of ♀ pale brown. Wings nearly clear.

♂. Face densely clothed with long silvery white hairs. Antennæ reaching to the scutellum. Mesothorax dull, clothed in front and on the sides with whitish hairs, posteriorly with fulvous. Scutellum with fulvous hairs. Metathorax finely rugose, clothed with fulvous hairs; the thorax beneath clothed with silvery hairs. Abdomen elliptic, shining, clothed with long scattered white hairs; each segment with an apical band of silvery hairs, narrowly interrupted in the centre; 6th and 7th segments clothed with white hairs with a slight golden tinge; beneath, apex of each segment piceous, and fringed thickly with short silvery hairs; apical ventral segment rounded at the apex. Legs densely clothed with silvery hairs; tarsi piceous.

♀. Head and thorax clothed with fulvous-brown hairs; mesothorax dull, punctured; metathorax finely rugose. Abdomen rather flat, ovate, shining, without definite puncturation; 2nd and following segments widely impressed along the apical margin; all the segments clothed sparingly with pale hairs; those on the 1st and 2nd longer than those on the following; 1st to 4th segments each with a narrow apical band of pubescence, that on the 1st fulvous, on the others white, and interrupted narrowly in the centre; 5th and 6th segments clothed with brown hairs; apical dorsal valve shining, triangularly raised in the centre; beneath finely and rugosely punctured, the apex of each segment narrowly pale, and thickly fringed with silvery hairs. Legs clothed with fulvous-brown hairs, those on the inner margin of the posterior tibiæ paler; floccus white; tarsi dark piceous. Length 9—11 mm.

Hab. Common; appears about the end of April, and is generally distributed.

35. *Andrena argentata*, Smith.

Smith, Zool., ii., p. 409; Cat. Brit. Hym., 2nd ed., p. 67.

Black, shining. ♂ clothed with long hoary pubescence. Abdomen shining, punctured; apex of each segment with a white pubescent band; apex of abdomen with golden hairs. Metatarsi black, four following joints piceous. ♀ with the pubescence of the head and thorax brownish. Abdomen shining, punctured; basal segment very remotely punctured; apex of each segment with a white band. Scopæ very pale greyish brown. Wings slightly dusky.

♂. Face clothed with grey hairs; clypeus dull, punctured. Antennæ reaching to the apex of the scutellum. Thorax clothed with grey hairs; mesothorax dull, largely and shallowly punctured; metathorax finely rugose. Abdomen ovate, shining; basal segment very remotely punctured, with a few long white hairs on the sides; following segments very finely and less remotely punctured; all the segments with a white apical band, widely interrupted in the centre of the 1st, and very narrowly in the three following; apical fringe pale golden; beneath with the apical margins of the segments pale, and fringed with long white hairs; apical ventral valve rounded and pale at the apex. Legs clothed with silvery hairs; apical joints of the tarsi piceous.

♀. Head and thorax punctured as in the ♂, but with the pubescence pale mouse-brown; that on the sides of the thorax paler. Abdomen ovate, shining; basal segment very finely and remotely punctured, with a few long hairs at the base and sides, its apex with a widely interrupted band of white hairs; following segments more closely punctured, impressed at the apex; 2nd, 3rd, and 4th with a white apical band, that of the 2nd interrupted in the centre; 5th and 6th clothed with pale brown hairs; apical dorsal valve triangularly raised in the middle, the flattened margin very wide; segments beneath narrowly pale at the apex, and fringed with long pale hairs. Legs densely clothed with pale brown hairs, those of the intermediate tibiæ dark; tarsi dark piceous. Length 8—10 mm.

Hab. In heathy localities, on flowers of *Erica*; Sandhurst, Chobham, Weybridge, Bournemouth, &c. July

and August. Last year at Bournemouth the ♂ was common at the end of July, but I obtained no ♀.

36. *Andrena chrysosceles*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 143; Smith, Cat. Brit. Hym., 2nd ed., p. 63.

Black; abdomen shining. ♂, clypeus white. ♀, face much wider than long; 3rd and 4th segments of abdomen in both sexes with an apical streak of silvery hairs on each side; apical fimbria bright golden; tarsi in both sexes, the base and apex of the posterior tibiæ in the ♂, and the entire posterior tibiæ in the ♀, clear testaceous. Wings slightly dusky; nervures testaceous.

♂. Face above the clypeus clothed with fulvous hairs; clypeus white, with two small black dots on the disk, and clothed with long white hairs. Antennæ reaching to the metathorax. Thorax finely rugulose and shallowly punctured; mesothorax and scutellum with fulvous hairs; metathorax finely rugose, its hairs paler than those of the scutellum. Abdomen shining, subelliptic, with a fine pale adpressed pubescence; basal segment finely and remotely punctured, the following more closely, and with a rather wide apical depression; all the segments pale at the extreme apex; the 2nd, 3rd, and 4th with a short, very narrow apical streak of white hairs on each side; apex of 5th, and the 6th and 7th segments with pale golden hairs; beneath clothed with long hairs; apex of 3rd, 4th, and 5th segment with a dense fringe of golden hairs; apical ventral valve pale, and somewhat pointed at the apex. Legs clothed with pale hairs; posterior tibiæ at the base and apex, and all the tarsi clear testaceous.

♀ larger than the ♂, but much like it in puncturation, &c.; face transverse, the clypeus black, and the bands of the abdomen more distinct, there being an interrupted apical band of silvery white hairs on the 2nd and 3rd segments, and an entire band on the 4th; the apex of the 5th, and the 6th densely clothed with golden hairs; apical dorsal valve piceous, flat, punctured, except at the margins, which are narrowly reflexed; beneath, the segments are punctured towards the apex and fringed with long hairs. Legs clothed with pale hairs; all the tarsi and the posterior tibiæ clear testaceous. Length 9—11 mm.

Hab. A somewhat rare species, occurring on *Umbelliferæ*, &c., in the summer, from May to August. London district, Chobham, Charlwood (Surrey), Hastings, Norfolk, and Devonshire.

37. *Andrena analis*, Panz.

Panz., Faun. Germ., 90, 14 & 15; Smith, Cat. Brit. Hym., 2nd ed., p. 64.

Shining, deep black. ♂, clypeus alone white; tarsi testaceous; tibiæ black. ♀, 1st and 2nd segments of the abdomen with a very narrow line of white pubescence at the apex; apical fimbria brown; posterior tibiæ and tarsi clear testaceous. Wings dusky; nervures piceous.

♂. Black, shining; head and thorax clothed with greyish hairs intermixed with black ones; clypeus white, with two small black dots, and clothed with white hairs; antennæ dark piceous; vertex shining, rugosely punctured; mesothorax shining, rather largely punctured; metathorax finely rugose. Abdomen shining, sparingly clothed with pale hairs, elongate; apex of 2nd and following segments deeply impressed; basal segment with only a few scattered punctures; the remaining segments more closely and rather largely punctured; apex of each segment impunctate, and with a fringe of very short pale hairs; apical dorsal valve testaceous and emarginate; beneath with long white hairs. Legs with erect white hairs; tarsi clear testaceous.

♀. Clypeus black; each side of the face clothed with white hairs, and with a few black ones near the insertion of the antennæ; vertex clothed with pale hairs behind, and with black in front. Mesothorax shining, punctured; disk very sparingly clothed with pale and black hairs intermixed; sides and beneath with grey hairs. Scutellum punctured. Metathorax finely rugose, with a dense long white pubescence on each side. Abdomen elliptic, finely punctured; segments impressed at the apex; 1st and 2nd segments with an apical fringe of very short white hairs; 3rd and 4th with a few short hairs at each side; 5th on its apical half, and the 6th clothed with brown hairs; apical dorsal valve flat; beneath punctured; segments fringed with long hairs at the apex. Legs with white hairs; femora densely clothed with long white hairs beneath, floccus white; posterior tibiæ and tarsi, and the apical joints of the

tarsi of the other legs, clear testaceous. Length 8—9 mm.

Hab. Common in some localities, especially in the north; Berwickshire, Wakefield, Ireland, Weybridge, July; Chobham, August; and one ♀ as early as June.

Is most like the following, under which their differences are pointed out.

38. *Andrena coitana*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 147; Smith, Cat. Brit. Hym., 2nd ed., p. 64.

Deep black, shining. ♂ with the clypeus and a spot on each side of the face, near its anterior lateral angle, white; legs entirely black. ♀ with a silvery white lateral spot at the apex of the 2nd and 3rd segments; legs entirely black; scopæ brown.

♂. Head rather wide, dull, finely and closely punctured, clothed with brown hairs on the vertex and the face above the antennæ, and with white hairs on the clypeus; clypeus shining, remotely punctured, white, with two black discal dots; labrum tuberculate; just at the side of the clypeus on each side of the face is a small white spot, which has almost the appearance of being part of the clypeus itself. Mesothorax very shining, with a few scattered brownish hairs, remotely punctured. Metathorax finely rugose. Abdomen shining, segments not impressed at the apex, very finely punctured at the base; 1st, 2nd, and 3rd segments each with a few pale lateral hairs at the apex; 4th and 5th with an apical band of pale hairs; 6th and 7th entirely clothed with them; beneath clothed with white hairs; apical valve rounded at the extremity. Legs entirely black, clothed with silvery white hairs.

♀. Head and thorax dull, closely punctured, with a few scattered very short hairs; clypeus black; frontal impressions filled with brown velvety hairs; scutellum closely punctured, especially round its edges; metathorax finely rugose, its basal area small. Abdomen very shining, elliptic; basal segment remotely punctured; the other segments impressed at the apex, and somewhat closely punctured at the base; 2nd and 3rd segments with an apical streak of white hairs on each side; 4th with an entire line of white hairs at the apex; 5th and

6th clothed with brownish hairs; apical dorsal valve flat; segments beneath punctured, each with an apical fringe of brownish hairs. Legs black, clothed with pale hairs; those of the scopæ with a brownish tinge. Length 8—9 mm.

Hab. Common in sandy and heathy localities.

The ♂ is very like that of *analis*, but the white spot on each side of the clypeus, the less hairy body, and the want of the apical impressions of the abdominal segments will distinguish it at once. The ♀ can only be confounded with the following; see notes to that species.

39. *Andrena lucens*, Imhoff.

Imhoff., Mitth. Schweiz. Ent. Ges., ii., p. 67.

Very like the preceding in general appearance, but differing in the following points:—

♂. Clypeus black; face clothed with longer hairs; vertex of the head more emarginate; mesothorax more closely punctured and more hairy at the sides; abdomen more ovate and more convex; 2nd, 3rd, and 4th segments impressed at the apex; 2nd and 3rd with a narrow distinct lateral line of white pubescence; the 4th with a continuous band; beneath, the 3rd, 4th, and 5th segments are densely fringed at the apex with somewhat recurved pale hairs, shortest in the middle; apical ventral valve somewhat truncate; all the tarsi clear testaceous.

♀ with the head wider than in *coitana*; the face clothed with white hairs; the scutellum dull and scarcely punctured; the basal area of the metathorax much larger; the basal segment of the abdomen wider and shorter; and the sides of the 2nd segment subparallel; thus giving the body an oval instead of an elliptic form, as in *coitana*; apical fimbria golden brown; puncturation, &c., much as in *coitana*; beneath punctured, segments clothed with long hairs at the apex. Legs clothed with pale hairs; tarsi testaceous at the apex; scopæ clothed with golden hairs. Length 8—9 mm.

Hab. Has only occured at present at Chobham, on *Erica*; and at Shipley, near Horsham.

40. *Andrena fulvago*, Christ.

Christ, Hym., p. 189, pl. xvi., fig. 7; Smith, Cat. Brit. Hym., 2nd ed., p. 59 = *constricta*, Smith, Cat. Brit. Hym., 2nd ed., p. 56.

Black; head and thorax clothed with fulvous hairs; clypeus black in both sexes. Abdomen shining, strongly punctured; apical fimbria bright golden. Posterior tibiæ and all the tarsi translucent, clear testaceous; scopæ clothed with bright golden hairs. Wings slightly dusky; nervures piceous.

♂. Face clothed with fulvous-brown hairs, with a line of darker ones on each side; clypeus largely and coarsely punctured; labrum simple. Antennæ reaching to about the scutellum; the joints at their bases, especially those towards the apex, with a narrow band of fine, pale, very short pubescence in front, giving the appearance of being banded with grey. Mesothorax rather densely clothed with fulvous-brown hairs, somewhat shining, strongly and deeply punctured. Metathorax finely rugose, rather sparingly clothed with fulvous hairs. Abdomen subovate, deeply punctured; 1st segment sometimes slightly constricted at the apex; 1st segment, base of 2nd, sides of all the segments, a line at the apex of the 3rd, 4th, and 5th, and the whole of the 6th and 7th, clothed with pale fulvous hairs; those of the 6th and 7th brighter and more golden; apex of each segment narrowly impressed and testaceous, the impressions nearly impunctate; beneath with the apex of each segment testaceous, clothed with long hairs, and with a dense fringe of golden hairs. Legs with golden hairs; posterior tibiæ and all the tarsi clear testaceous.

♀. Very like the ♂, but larger. Antennæ shorter, and without the grey pubescent bands. Thorax and abdomen much as in the ♂, but the 5th and 6th segments clothed with very bright golden hairs; ventral dorsal valve flat, punctured; beneath with the segments fringed with long golden hairs. Legs clothed with golden hairs; posterior tibiæ and all the tarsi very bright clear testaceous; the scopæ golden; the hairs long and plumose. Length 9—10 mm.

Hab. Not common; Chobham, Weybridge, Blackwater, Isle of Wight, Bristol, &c.

The var. of the ♂ with the 1st segment slightly constricted at the apex = *A. constricta*, Smith; it possesses

no other structural character, and is taken with the typical form.

41. *Andrena polita*, Smith.

Smith, Zool., v., p. 1733.

"♂. Length 5 lines. The pubescence on the clypeus white, above which it is pale fulvous; the cheeks have a long beard, and the mandibles a fringe of very pale pubescence; the femora have a fringe of the same colour; on the tibiæ and tarsi it is pale fulvous, the apical joints of the latter being pale ferruginous; on the disk of the thorax the pubescence is fulvo-ochraceous; the wings as in the ♀; abdomen oblong-ovate, very glossy, its pubescence as in the ♀; the margins of the segments depressed and narrowly rufo-testaceous."

"♀. Length 5½ lines. Black; the face thinly clothed with fulvous pubescence, the flagellum fulvo-piceous beneath. Thorax: the disk thinly clothed with rufo-fulvous pubescence, on the metathorax and sides it is paler; the wings subhyaline, their apical margins clouded, the tegulæ rufo-testaceous; the pubescence of the legs fulvous, the scopæ bright fulvous, the floccus pale fulvous; the tarsi ferruginous. Abdomen shining, oblong-ovate, closely and delicately punctured; the apical margins of the segments obscurely rufo-testaceous; the 2nd, 3rd, and 4th segments having a narrow pale fulvous fringe, more or less obliterated in the middle; the 5th apical segment clothed with bright fulvous pubescence."

Hab. "This beautiful species was discovered in the chalk-pits at Northfleet some years ago, in the month of July, where it has since been met with, but not in any other locality; it appears to be a rare insect."

Not possessing this species, and not being able to refer to the typical specimens, I have copied out F. Smith's description from his 'Catalogue of British Hymenoptera in Coll. Brit. Museum,' pt. 1, 1855. It appears to be very distinct from any other of our British species.

Division VII.

(4) 1. ♂, clypeus white. ♀, abdomen with anal fringe golden, unbanded, or strongly punctured.

(3) 2. Abdomen without lateral white streaks .. .. *humilis.*

(2) 3. Abdomen with lateral white streaks, strongly punctured.. .. .. *labialis.*

(1) 4. ♂, clypeus black. ♀, anal fringe pale or golden, or dark, not strongly punctured, often banded.

(8) 5. Species very small and black; pubescence silvery or grey; abdomen rarely banded.

(7) 6. Abdomen not punctured .. .. *minutula.*

(6) 7. Abdomen punctured .. .. *nana.*

(5) 8. Species not very small; pubescence of thorax brown.

(14) 9. Hairs of the face brownish or pale fulvous.

(11) 10. Metathorax clathrately rugose at the base .. *proxima.*

(10) 11. Metathorax finely rugose, not clathrate.

(13) 12. ♂, abdomen with only short lateral white streaks. ♀ with a dense tuft of curved hairs on each side of the metathorax .. .. *dorsata.*

(12) 13. ♂, abdominal bands almost entire. ♀, metathorax simply hairy at the sides .. .. *Afzeliella.*

(9) 14. Hairs of the face below the antennæ silvery white *Wilkella.*

42. *Andrena humilis*, Imhoff.

Imhoff, Isis, 1832, ix., p. 1201 = *fulvescens*, Smith, Cat. Brit. Hym., 2nd ed., p. 60.

Black, clothed with ochreous hairs. ♂, clypeus white; abdomen dull in both sexes, very closely and rugosely punctured; anal fimbria golden; tibiæ and tarsi black, clothed with golden hairs. Wings slightly dusky; nervures testaceous.

♂. Vertex of head, face above the antennæ, and thorax above, clothed with dull ochreous-brown hairs, clypeus and under side of the thorax with white hairs. Clypeus white, with a black dot near each side. Mesothorax finely rugose and rugosely punctured. Metathorax finely rugose and clothed with hairs, except on the basal area. Abdomen clothed with long pale hairs on the basal segment and at the sides, with shorter pale hairs on the other segments, becoming golden on the 6th and 7th; surface rugose and rugosely punctured; apex of each segment smooth and somewhat piceous; beneath clothed with long pale hairs; apical ventral valve truncate and testaceous at its apex. Legs clothed with pale hairs.

♀. Face sparingly clothed with pale fulvous hairs. Mesothorax dull, finely rugulose and very closely punctured, with a few short pale hairs on its upper surface; beneath the wings clothed with long hairs. Scutellum somewhat shining and closely punctured. Metathorax

finely rugose, hairy at the sides. Abdomen nearly naked on the disk, finely rugose and rugosely punctured, dull; the apical margins of the segments impressed and smoother, the extreme apex piceous; 5th and 6th segments clothed with golden hairs; apical dorsal valve flat; beneath punctured, the segments fringed with pale hairs. Legs black, clothed with golden hairs; scopæ golden. Length 9—10 mm.

Hab. Local, but common in many places. Hampstead, Blackwater (Hants), Tunbridge Wells, Hastings, Isle of Wight, Bournemouth, near Liverpool, &c.

The ♂ is quite distinct from any other species by its hairy unbanded body and white clypeus; the ♀ can only be confounded with *fulvago*, but its black posterior tibiæ and its dull rugose abdomen will easily distinguish it.

43. *Andrena labialis*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 148; Smith, Cat. Brit. Hym., 2nd ed., p. 62.

Black, clothed with greyish ochreous hairs. ♂, clypeus and sides of the face white. Abdomen closely and very finely punctured; 2nd, 3rd, and 4th segments with a white apical line. ♀ large, orbital impressions filled with pale golden pubescence. Abdomen with four pale pubescent bands; apical fimbria golden. Wings slightly dusky; nervures testaceous.

♂. Head punctured, clothed with brownish grey hairs; clypeus white, with a black dot on each side; sides of the face each with a white spot, adjoining the clypeus and extending upwards to about the level of the antennæ. Antennæ reaching to the scutellum. Mesothorax closely and rugosely punctured, clothed with brownish grey hairs. Metathorax with the basal area clathrate, the sides punctured and hairy. Abdomen dull, very closely punctured, especially towards the apex, clothed with short brownish grey hairs; 2nd, 3rd, and 4th segments with an apical line of white hairs, that of the 2nd and 3rd widely interrupted; 6th and 7th segments clothed with golden brown hairs; beneath punctured, apices of the segments piceous, and fringed with golden brown hairs; apical ventral valve longitudinally curved, looked at sideways, with its apex bifid (see pl. x., figs. 5*a*, 5*b*). Legs with greyish hairs; tarsi testaceous at the apex.

♀. Only differs from the ♂ in having, besides the ordinary sexual characters, the face black, the clypeus black and strongly punctured, the sides of the face clothed with pale hairs, and the orbital impressions filled with golden velvety pubescence; in having the thorax nearly naked on the disk, and the base of the metathorax more finely clathrate, the abdomen wider and the white bands more distinct, the apex of the 5th and the 6th segments clothed with bright golden hairs; apical dorsal valve flat and simple; beneath punctured, segments fringed at the apex with long golden hairs. Legs with pale golden hairs; tarsi testaceous at the apex. Length 11—14 mm.

Hab. Common and generally distributed.

44. *Andrena minutula*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 161; Smith, Cat. Brit. Hym., 2nd ed., p. 66 = *parvula*, Kirby, Smith, &c.

Small, black. Abdomen dull in both sexes, finely rugulose, but not punctured. Scopæ of ♀ silvery or brownish grey.

♂. Head and thorax finely rugulose and punctured; face clothed with long black hairs in the early spring form, with shorter grey ones in the summer and autumn form. Antennæ reaching to the scutellum. Mesothorax clothed with greyish brown hairs. Metathorax finely rugose, the rugosities longitudinal at the base, sides with long hairs. Abdomen finely rugulose, not punctured, the apex of each segment smooth and shining; surface clothed with short pale hairs; 2nd, 3rd, and 4th segments with a little white pubescence on each side at the apex, 6th and 7th segments clothed with white hairs with a slight golden tinge; beneath clothed with white hairs, apical ventral segment somewhat rounded. Legs black, with silvery grey hairs; tarsi piceous at the apex.

♀. Head clothed with pale yellowish grey hairs. Vertex longitudinally rugose. Clypeus largely punctured; orbital impressions filled with golden pubescence. Mesothorax finely rugulose and rather closely punctured. Metathorax finely rugose, its sides clothed with yellowish grey hairs. Abdomen ovate, finely rugulose, not punctured; 2nd and 3rd segments with a few silvery hairs on each side at the apex; 4th segment with an

entire apical band of silvery hairs; 5th and 6th segments clothed with golden brown hairs; apical dorsal valve triangularly raised in the centre and punctured, its margins slightly reflexed, smooth, and shining; beneath clothed with grey hairs. Legs black, clothed with grey hairs; scopæ silvery grey, with a more or less brownish tint; tarsi piceous at the apex. Length 5½—7 mm.

Hab. Common and generally distributed. Occurs as an early spring bee in April, and again in July and August.

Many authors have separated the spring and autumn forms as two species. The characters, however, are so slight that I think it is far more probable that they are only forms of one which is double-brooded.

In the spring form (*parvula*) the ♂ has the face densely clothed with black hairs, and the ♀ has the antennæ black, and the 1st segment of the abdomen slightly more rounded at the sides. In the summer form (*minutula*) the ♂ has the face with shorter grey hairs, and the ♀ has the antennæ slightly piceous beneath, and the 1st segment of the abdomen slightly less rounded at the sides.

45. *Andrena nana*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 161; Smith, Cat. Brit. Hym., 2nd ed., p. 67.

This species is exactly like the preceding in size and colour, and may easily be mistaken for it; the following characters will, however, distinguish it:—

In the ♂ the antennæ are rather longer, the mesothorax is rather less closely punctured, the abdomen is finely rugulose and also distinctly punctured, and the outer forceps of the genitalia are wider at the apex.

In the ♀ the mesothorax is slightly less rugulose, the abdomen punctured as in the ♂, and the white pubescence denser, forming more distinct bands. Length 5½—7 mm.

Hab. Common and generally distributed. Occurs in May, June, and July.

46. *Andrena proxima*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 146 = *Collinsonana*, Kirby, Smith, &c.

Black; clothed with greyish hairs on the head and thorax in the ♂, with pale brown in the ♀. Abdomen very finely rugulose and remotely punctured; 2nd, 3rd, and 4th segments with a lateral streak of pale hairs at the apex; apical fimbria golden. Legs black; tarsi piceous. ♀; scopæ brownish grey. Wings dusky.

♂. Face clothed with brownish grey hairs. Antennæ reaching to the scutellum. Mesothorax dull, finely rugulose, and rather closely punctured, clothed with brownish grey hairs. Metathorax somewhat clathrately rugose, basal area undefined. Abdomen shining, segments much impressed at the apex, finely punctured and clothed with short grey hairs; sides of all the segments and an apical band on each of the 1st, 2nd, 3rd and 4th clothed with long semi-erect white hairs; 6th and 7th segments clothed with white hairs with a slight golden tinge; beneath finely punctured, segments pale at the apex, and fringed with long white hairs; apical ventral valve somewhat truncate. Legs clothed with grey hairs; tarsi piceous towards the apex.

♀. Head and thorax clothed with brownish grey hairs. Mesothorax dull, rather closely and largely punctured. Metathorax finely and clathrately rugose, basal area ill-defined. Abdomen slightly shining, very finely rugulose and remotely punctured, segments with a wide impunctate apical impression, the 2nd, 3rd, and 4th with a lateral streak of white hairs at the apex, 5th and 6th clothed with golden brown hairs; apical dorsal valve with its sides slightly reflexed; beneath punctured; apex of each segment narrowly testaceous and fringed with long brownish-grey hairs. Legs black, clothed with greyish hairs; scopæ silvery, with a slight brownish tinge; tarsi testaceous towards the apex. Length 9—10 mm.

Hab. Rare. Occurs in June, and has been taken at Norwich, Weybridge, Blackwater (Hants), Hastings, Bristol, and Sidmouth.

47. *Andrena dorsata*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 144; Smith, Cat. Brit. Hym., 2nd ed., p. 68 = *combinata*, Kirby, Smith, &c. Var. = *connectens*, Kirby?

Black. Mesothorax clothed with bright fulvous hairs. ♂; abdomen shining, punctured, scarcely rugulose, elongate-elliptic. ♀; abdomen ovate, 2nd and 3rd segments with a lateral streak, and 4th with an apical band of white or very pale fulvous pubescence; 5th and 6th segments clothed with brown hairs; posterior tarsi in both sexes, and often the tibiæ, more or less testaceous. Wings slightly clouded at the apex; nervures pale testaceous.

♂. Face densely clothed with pale fulvous hairs. Antennæ reaching to the post-scutellum; 3rd joint short, scarcely longer than it is wide across the apex. Mesothorax clothed with fulvous hairs, dull and finely rugulose, and with rather large distinct punctures. Metathorax rugose, its basal area well defined; sides with long, pale, fulvous hairs. Abdomen shining, finely punctured, scarcely rugulose, clothed with pale hairs on the two basal segments, and with very short dark ones on the 3rd and 4th; 5th, with a few black ones at the base, its apex and the 6th and 7th clothed with pale fulvous hairs; apex of each segment piceous, that of the 2nd, 3rd, and 4th with a little pale fulvous pubescence on each side; beneath punctured and finely rugulose, the segments rather widely pale at the apex, and clothed with long pale hairs; apical ventral valve subtruncate at the apex. Legs clothed with pale fulvous hairs; all the tarsi, and more or less of the apex of the posterior tibiæ in the autumn form, and the posterior tarsi only in the spring form, pale testaceous.

♀. Face clothed at the sides and round the antennæ with pale fulvous hairs; orbital impressions filled with dark brown velvety pubescence. Mesothorax clothed with bright fulvous hairs, finely rugulose and punctured. Metathorax rugose, basal area clearly defined, and with a slightly raised dorsal line, sides with a dense tuft of curved pale fulvous hairs. Abdomen ovate, very finely punctured, the apex of each segment very narrowly piceous; basal segment with a few fulvous hairs on each side, 2nd and 3rd with a streak of white or very pale fulvous hairs on each side at the apex, 4th with an entire

apical streak, 5th and 6th clothed with golden brown hairs; beneath clothed with grey hairs. Legs with pale fulvous hairs; posterior tarsi, and the apex of the posterior tibiæ also (in the spring form) clear testaceous; apical joints of all the tarsi testaceous. Length 9—11 mm.

Hab. On sallows in spring, and blackberry flowers in summer. A local species, but occurring at Norwich, Southwold, Chobham, Bournemouth, and in Devonshire.

This is, I believe, another double-brooded species considered by some authors as constituting two, but the distinguishing characters are so slight and almost exclusively those of coloration that I have no hesitation in uniting the forms to which they belong.

48. *Andrena Afzeliella*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 169; Smith, Cat. Brit. Hym., 2nd ed., p. 71.

Var. *fuscata*, Kirby, Smith.

Var. (stylopized) *convexiuscula*, Kirby, Smith, &c.

Black. ♂ with the head and thorax clothed with pale fulvous hairs, thorax of the ♀ with fulvous-brown hairs; segments of the abdomen in the ♂ with pale fulvous-brown apical fasciæ, interrupted on the 2nd and 3rd. Abdomen in ♀ short and ovate, 2nd, 3rd, and 4th with a whitish apical fringe, that of the 2nd interrupted; apical fimbria brown; posterior tibiæ of ♀ generally testaceous.

♂. Head and thorax densely clothed with pale fulvous-brown hairs. Antennæ reaching to about the base of the metathorax; 3rd joint distinctly shorter than 4th. Mesothorax finely rugulose and punctured. Metathorax finely rugose. Abdomen ovate, dull, finely rugulose and punctured; base of the 1st segment and sides of the others with long scattered pale hairs; each segment with an apical band of pale hairs, that on the 1st segment widely, that on the 2nd narrowly, interrupted in the middle; 6th and 7th segments entirely clothed with pale golden hairs; segments beneath widely pale at the apex, clothed with long pale hairs; apical ventral valve somewhat rounded at the extremity. Legs clothed with pale hairs; posterior tarsi and base of the tibiæ sometimes testaceous.

♀. Face short, transverse, clothed with pale fulvous hairs. Mesothorax clothed with fulvous-brown hairs, very finely rugulose and punctured. Scutellum rather more shining than the mesothorax, punctured. Metathorax finely rugose, clothed with pale fulvous hairs, especially at the sides. Abdomen short, ovate, dull, very finely rugulose and finely punctured; basal segment with a few pale hairs on each side at the apex, 2nd segment with a widely interrupted apical band, 3rd and 4th segments with entire apical bands of short pale fulvous, or sometimes nearly white, hairs, 5th segment, except at the base, and the 6th densely clothed with dark brown hairs; segments beneath narrowly testaceous at the apex, and fringed with pale hairs. Legs clothed with pale hairs, intermediate tibiæ with brown; posterior tibiæ and tarsi generally pale testaceous, but sometimes dark; scopæ golden. Length 8—10 mm.

Hab. Common and generally distributed. Occurs in April, and also often in the autumn.

I regard *convexiuscula*, Kirby, as only a stylopized variety of this species.

49. *Andrena Wilkella*, Kirby.

Kirby, Mon. Ap. Angl., ii., p. 145 = *xanthura*, Kirby, Smith, &c. (ex. ♂?), Cat. Brit. Hym., 2nd ed., p. 74; ♂ = *similis*, Smith.

This species is very closely allied to *Afzeliella*, but is, I believe, clearly distinct by the following characters:—

♂. Hairs of the face below the antennæ silvery white; 3rd joint of antennæ longer than the 4th, or at least as long. Mesothorax clothed with bright fulvous hairs, with a larger, deeper puncturation. Abdomen without transverse bands, deep black, with a very fine short white pubescence, and only slight indications of apical bands at the extreme sides of the 2nd and 3rd segments; apical ventral valve somewhat truncate; apex of posterior tibiæ and the tarsi testaceous.

♀. Larger than *Afzeliella*; the face less transverse, and clothed below the antennæ with silvery white hairs. Mesothorax and post-scutellum clothed with very bright rich fulvous hairs. Wings rather dusky. Abdomen more elongate, 1st segment less transverse, apical fasciæ of the 2nd and 3rd segments interrupted, and composed of rather longer hairs; apical fimbria bright golden;

posterior tibiæ and tarsi and intermediate tarsi clear testaceous. Length 9—12 mm.

Hab. Generally distributed and common in some localities. The ♂ which I have referred to this species is that which F. Smith describes under the name *similis*. I take it in April and May on Wandsworth Common in the same locality as the ♀, and the white silvery pubescence of the face is so alike in the two sexes that I feel convinced that they belong to the same species. The ♂, which F. Smith describes under *xanthura*, is, I believe, a variety of *Afzeliella*. I have adopted the name of *Wilkella* for this species, as it precedes that of *xanthura* in Kirby's Monograph.

Macropis, *Panz.*

Panz., Faun. Germ., 107, 16. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd ed., pl. vi.

Labial palpi 4-jointed. Maxillary palpi 6-jointed. Anterior wings with two submarginal cells; posterior femora and tibiæ in the ♂, and tibiæ and metatarsi in the ♀, dilated. Abdomen black, shining.

We have only one species of this genus, which cannot be confounded with anything else. The only other genus with two submarginal cells belonging to this section of the Acutilingues is *Dasypoda*, whose elongate hairy body and simple legs will distinguish it at once.

1. *Macropis labiata*, Fabr.

Fabr., Syst. Piez., p. 333; Smith, Cat. Brit. Hym., 2nd ed., p. 104.

Black, shining; face of ♂ white; labrum black. Abdomen with a narrow apical band on the 3rd and following segments. ♂, tibiæ dilated; scopæ of ♀ yellowish white; metatarsi black. Wings rather smoky.

♂. Head and thorax largely and closely punctured, clothed with brownish hairs; face below the antennæ, a spot on the mandibles near the base, and sometimes one on the scape of the antennæ, yellowish white. Antennæ reaching to the base of the abdomen, fulvous beneath. Metathorax coarsely rugose at the base. Abdomen very shining, largely and distantly punctured on the 1st and 2nd segments, more closely on the following; 3rd, 4th,

and 5th segments with an apical band of snow-white hairs, interrupted on the 3rd; centre of the 7th segment raised, produced at the apex beyond the sides; beneath very shining, 3rd and 4th segments with a golden fringe, 5th largely emarginate, the emargination fringed with short hairs, 6th densely clothed with short golden hairs, (for 7th, 8th, and genitalia see pl. x., figs. 1, 1*a*—*d*). Legs clothed with pale hairs; tarsi piceous; posterior femora swollen, punctured; tibiæ dilated, the upper margin curved, the lower margin somewhat produced near the apex, and then slightly sinuate (see pl. x., figs. 1*e*, 1*f*), calcaria pale; tarsi very short.

♀. Rather shorter than the ♂; face black, and the antennæ shorter; the thorax less hairy; the abdomen shorter, with an interrupted snow-white streak on the 3rd segment, and an entire one on the apex of the 4th, the 5th with sooty hairs, the 6th with black; beneath, the 2nd, 3rd, and 4th segments are fringed at the apex with golden hairs, the 5th and 6th with brown. Legs clothed with brown hairs; posterior pair with the scopæ yellowish white; metatarsi dilated, densely clothed with black hairs; tarsi piceous at the apex. Length 9—10 mm.

Hab. Very rare. Mr. Bridgman has taken both sexes at Norwich off thistles; the other known British localities are the New Forest and Weybridge.

Dasypoda, *Latr.*

Latr., Hist. Nat., iii., p. 372. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd ed., pl. vii.

Labial palpi 4-jointed. Maxillary palpi 6-jointed. Anterior wings with two submarginal cells. Body hairy; posterior tibiæ and metatarsi, especially in the ♀, clothed with very long hairs; tibia destitute of a patella.

A very distinct genus; the ♂ looks rather like a large elongate *Andrena*, but the want of the 3rd submarginal cell is a distinct characteristic.

1. *Dasypoda hirtipes*, Latr.

Latr., Hist. Nat. xiii., p. 369; Smith, Cat. Brit. Hym., 2nd ed., p. 103.

Black; ♂ clothed with pale fulvous hairs; each segment of the abdomen with a pale fulvous apical band; ♀ with the thorax clothed with fulvous hairs, with a

black band across the centre. Abdomen with a band of white hairs at the apex of the 2nd, 3rd, and 4th segments; apical fimbria black. Posterior tibiæ and metatarsi clothed with very long bright golden-fulvous hairs. Wings slightly dusky.

♂. Head and thorax densely clothed with pale fulvous hairs, that on the face and below the wings paler. Antennæ entirely black, reaching nearly to the scutellum. Abdomen with the first three segments clothed nearly entirely with long pale hairs, the following three with black hairs at the base and a pale band at the apex, the 7th with black hairs; beneath with pale hairs, the 5th with black, 6th nearly glabrous; (for 7th, 8th and genitalia see pl. xi., figs. 3, 3*a*, 3*b*). Legs clothed with very long pale hairs; tarsi beneath with bright fulvous hairs.

♀. Vertex of the head clothed with black hairs, face below the antennæ with grey. Mesothorax with black hairs across the disk and fulvous-brown hairs round it; beneath with pale fulvous-grey hairs. Abdomen shining; apex of each segment smooth and piceous, pubescence of the basal segment pale, that of the others black, the 2nd, 3rd, and 4th with a subapical band of white hairs, the upper two narrowly interrupted, 5th and 6th segments densely clothed with erect grey-black hairs; beneath with the segments densely fringed at the apex with sooty black hairs. Anterior legs clothed with dark hairs in front and pale behind; intermediate legs with brown hairs, posterior with fulvous, the scopæ and metatarsi being covered with extremely long, bright, golden-fulvous hairs, which give the insect a character distinguishing it at once from any other of our British Hymenoptera; tarsi piceous at the apex. Length 15—16 mm.

Hab. This beautiful insect is not rare in sandy localities, and seems to be pretty well distributed over the South of England, especially along the coast. It appears in July and August.

Cilissa, *Leach.*

Leach, Ed. Enc. ix., p. 155. For figures of generic characters see F. Smith, Cat. Brit. Hym., 2nd. ed., pl. vii.

Labial palpi 4-jointed. Maxillary palpi 6-jointed. Anterior wings with three submarginal cells. Apical joint of the antennæ obliquely truncate.

A genus very closely allied to *Andrena*, but distinguished by the truncature of the apical joint of the antennæ.

1. ♂; abdomen without distinct pale apical bands to the segments. ♀; anal fringe golden .. *hæmorrhoidalis*.
2. ♂; abdomen distinctly banded. ♀; anal fringe black-brown .. .. *leporina*.

1. *Cilissa hæmorrhoidalis*, Fabr.

Fabr., Syst. Ent., p. 377; Smith, Cat. Brit. Hym., 2nd ed., p. 76.

Black; ♂ clothed with pale greyish brown hairs, ♀ with fulvous-brown. Abdomen not distinctly banded; ♀, scopæ and anal fringe golden-fulvous. Wings nearly clear.

♂. Head and thorax clothed with pale brownish grey hairs, those on the disk of the mesothorax nearly black. Antennæ with the joints very arcuate, apical joint diagonally truncate. Mesothorax punctured. Metathorax finely rugose. Abdomen largely punctured, clothed with pale hairs, intermixed with a few black ones on the base of the 3rd and following segments; beneath clothed with pale hairs; 6th ventral segment narrow and angularly produced at the sides, clothed with golden hairs, 8th ventral with the apex truncate and dilated, the truncature circular or nearly so; (for 7th and 8th ventral segments and genitalia see pl. xi., figs. 1, 1*a*, 1*b*). Legs with pale hairs; tarsi piceous at the apex, clothed with golden hairs beneath.

♀. Rather larger and wider than the ♂, the pubescence darker and more fulvous; puncturation, &c., of thorax as in the ♂. Abdomen rather more finely punctured, dull; 1st segment short, subtruncate at the base, all the segments clothed with short pale hairs, 3rd and 4th with a very narrow apical fringe of paler hairs, 5th and 6th clothed with bright golden-fulvous hairs; beneath rather densely clothed with long golden hairs. Legs piceous, clothed with fulvous hairs; scopæ and posterior tarsi bright fulvous. Length 12—15 mm.

Hab. Frequents the bells of *Campanula rotundifolia*, and has occurred at Shirley, Norwich, Chobham, Kingsdown near Deal, Weybridge, Bournemouth, Bath, Bristol, Devonshire, &c.

2. *Cilissa leporina*, Panz.

Panz., Faun. Germ., 63, 21; Smith, Cat. Brit. Hym., 2nd ed., p. 77.

Black, clothed with pale fulvo-ochraceous hairs. Abdomen with pale apical bands to the segments; anal fimbria black; scopæ of ♀ pale ochreous-grey. Wings nearly clear.

♂. Head and thorax punctured, clothed with very pale ochreous hairs, intermixed with black on the disk of the mesothorax. Antennæ slightly piceous beneath, apical joint diagonally truncate. Metathorax finely rugose. Abdomen rugosely punctured; 1st and 2nd segments densely clothed with pale hairs, 3rd and following segments with black hairs at the base and a band of pale hairs at the apex; beneath with pale hairs; apical ventral valve dilated at the apex and truncate, the truncature nearly circular; (for 6th, 7th and 8th ventral segments and genitalia see pl. xi., figs. 2, 2*a*, 2*b*). Legs clothed with pale hairs; tarsi testaceous towards the apex.

♀. With the pubescence rather darker and browner than that of the ♂. Head and thorax punctured, &c., as in that sex. Abdomen wider, the pubescence shorter; 1st and 2nd segments clothed all over with pale hairs, 3rd and 4th with black hairs at the base and a well-marked band of pale hairs at the apex, 5th and 6th clothed with black hairs, the 5th with a tuft of pale ones on each side, beneath clothed with pale; 5th and 6th segments with black-brown hairs. Legs with pale hairs; tarsi at the apex testaceous, and clothed beneath with fulvous hairs. Length 12—14 mm.

Hab. Not rare in July and August. I have taken it at Hastings, Littlehampton, Bournemouth, and Chobham; and it has also occurred at Hampstead, Gravesend, Erith, Deal, and Norwich.

Explanation of Plates.

PLATE VII.

Fig. 1. *Colletes fodiens.* ♂ armature, dorsal view.
2. ,, *cunicularia* ,, ,,
3. ,, *picistigma* ,, ,,
4. *Prosopis cornuta* ,, showing 7th and 8th ventral plates.
5. ,, *pictipes* ,, ,,
6. ,, *brevicornis* ,, dorsal view.
7. ,, *signata* ,, ,,
8. ,, *confusa* ,, ,,
9. ,, *communis* ,, ,,
10. ,, *hyalinata* ,, showing 8th ventral plate.
11. ,, *dilatata* ,, dorsal view.
12. ,, *punctulatissima* ,, ,,
13. *Colletes marginata* ,, ,,
14. ,, *succincta* ,, ,,
15. ,, *Davicsana* ,, ,,

PLATE VIII.

1. *Sphecodes puncticeps.* ♂ armature, dorsal view.
1*a*. ,, ,, ,, apical view.
2, 2*a*. ,, *subquadratus* ,, dorsal and apical views.
3, 3*a*. ,, *gibbus* ,, ,,
4, 4*a*. ,, *similis* ,, ,,
5, 5*a*. ,, *pilifrons* ,, ,,
6, 6*a*. ,, *ephippium* ,, ,,
7, 7*a*. *Halictus quadricinctus* ,, ,,
8, 8*a*. ,, *rubicundus* ,, ,,
9, 9*a*. ,, *zonulus* ,, ,,
10, 10*a*. ,, *leucozonius* ,, ,,
11, 11*a*. ,, *quadrinotatus* ,, ,,
12, 12*a*. ,, *maculatus* ,, ,,
13, 13*a*. ,, *xanthopus* ,, ,,
14, 14*a*. ,, *sexnotatus* ,, ,,

PLATE IX.

Fig. 1. *Halictus cylindricus*, ♂ armature, dorsal view.
1*a*. ,, ,, ,, apical view.
2, 2*a*. ,, *morio*, ,, dorsal and apical views.
3, 3*a*. ,, *leucopus* ,,
4, 4*a*. ,, *malachurus* ,,
5, 5*a*. ,, *Smeathmanellus* ,, dorsal and apical views.
6, 6*a*. ,, *tumulorum* ,, ,,
7, 7*a*. ,, *puncticollis* ,, ,,
8, 8*a*. ,, *albipes* ,, ,,
9, 9*a*. ,, *prasinus* ,, ,,
10, 10*a*. ,, *pauxillus* ,, ,,
11, 11*a*. ,, *longulus* ,, ,,
12, 12*a*. ,, *subfasciatus* ,, ,,
13, 13*a*. ,, *punctatissimus* ,, ,,
14, 14*a*. ,, *brevicornis* ,, ,,
15, 15*a*. ,, *villosulus* ,, ,,
16, 16*a*. ,, *nitidiusculus* ,, ,,
17, 17*a*. ,, *minutus* ,, ,,
18, 18*a*, 18*b*. ,, *lævigatus* ,, dorsal, apical, and lateral views.
19, 19*a*. ,, *atricornis* ,, dorsal and apical views.
20, 20*a*. ,, *minutissimus* ,, ,,

PLATE X.

1. *Macropis labiata*, ♂ armature, dorsal view.
1*a*. ,, ,, ,, apical view.
1*b*. ,, ,, ,, 7th ventral segment.
1*c*. ,, ,, ,, 8th ventral segment.
1*d*. ,, ,, ,, ,, ,, lateral view.
1*e*. ,, ,, ,, posterior tibiæ, external side.
1*f*. ,, ,, ,, posterior tibiæ, internal side.
2. *Sphecodes subquadratus*, ♂ antenna.
3. ,, *pilifrons* ♂ ,,
4. *Andrena cingulata*, ♂ armature, dorsal view.
4*a*. ,, ,, ,, apical view.
5. ,, *labialis* ,,
5*a*. ,, ,, ,, 8th ventral segment.
5*b*. ,, ,, ,, ,, ,, lateral view.

Fig. 6. *Andrena Trimmerana*, ♂ posterior leg to show patella (*a*).
7. ,, ,, base of posterior tibiæ enlarged; (*a*) patella.
8. *Sphecodes pilifrons*, ♂ posterior wing to show alar hooks.
9. ,, *subquadratus* ,, ,,

PLATE XI.

1. *Cilissa hæmorrhoidalis*, ♂ 8th ventral segment.
1*a*. ,, ,, ,, armature.
1*b*. ,, ,, ,, 7th ventral segment.
2. ,, *leporina*, ♂ 6th ventral segment.
2*a*. ,, ,, ,, 7th and 8th ventral segments.
2*b*. ,, ,, ,, armature.
3. *Dasypoda hirtipes*, ♂ armature.
3*a*. ,, ,, ,, 7th ventral segment.
3*b*. ,, ,, ,, 8th ventral segment.
4. *Andrena Trimmerana*, ♂ 8th ventral segment.
4*a*. ,, ,, ,, armature, to show normal form of this organ in the genus.
5. ,, *Hattorfiana*, ♂ armature.
6. *Halictus*; apex of abdomen in ♀, showing rima on 5th segment.

XI. *Notes on the* Euchalcis vetusta, *Dufour* (Fam. Chalcididæ); *and on the terminal segments of the females in* Halticella *and its allies.* By Sir Sidney Saunders, C.M.G.

[Part I.—Read February 1st, 1882.]

Plate XII.

In the recently published 3e trimestre of the 'Annales de la Société Entomologique de France,' 1881 (6e série, tome 1), M. Edmond André, in his "Notes Hyménoptérologiques" (p. 333), has revised the sectional divisions introduced into the genus *Chalcis* of Fabricius, which, for the reasons adverted to, he would restrict to *three*; namely, (1) *Chalcis* proper; (2) *Smicra*, Spinola; and (3) *Halticella*, Spinola. To this last he refers the genus *Euchalcis* of Dufour, who described four species from Spain in the aforesaid 'Annales' for 1861 (4e série, tome 1, p. 9; pl. 1, figs. 4—7, and figs. 8—10). The third species—his *E. vetusta*, taken by himself near Saragossa—is thus characterised:—"*Euchalcis vetusta*, Duf. Atra, nitida, subtiliter punctata; capite subtriangulari; scutello convexo subrotundato acute bispinoso; metathorace utrinque bispinuloso, albo-sericeo punctato; tegula rufa; alis fumosis, basi punctoque in medio subcostali diaphanis; abdomine conico, acutissimo, subtrigono, levi, ferrugineo, apice nigro; pedibus nigris, tarsis fuscescentibus; femoribus posticis subtus ad basin obtuse bidentatis. Long. 3 lin."

"Mense martio 1811 capiebam hanc speciem Zaragoza circa."

To this he appends the following remarks:—"Cette espèce d'*Euchalcis*, dont j'ai conservé une description suffisament détaillée, n'est plus en mon pouvoir. Elle passa en 1815 dans la collection de Latreille, et de là je ne sais où. Elle a tous les caractères indiqués dans le signalement générique."

In our Transactions for 1873 (p. 414) I described the two sexes of an allied species, under the name of *Halticella osmicida*, found in Epirus, within the desiccated

blackened tegument of the adult larvæ of *Osmia tridentata*, and undergoing their metamorphoses therein, each occupying the interior of a single larva, having the head directed towards the broad anal segments of the latter, thus pointing downwards in the briar-cells, and issuing therefrom in the imago state about the middle of June. This differed from Dufour's species in having the *incrassated posterior femora bright red* in the female, and the *tegula black*; whereas in the corresponding sex of the latter all the legs were black, and the tegula red.

M. Jules Lichtenstein, of Montpellier, the following year obtained a female, which he supposed to be the lost *Euchalcis vetusta*, Duf., from briars in the South of France;—found "à l'intérieur d'une larve d'*Osmia* toute déséchée et d'un noir de jais brillant" ('Annales,' 1874; Bulletin, p. lxiv). He had not then been enabled to determine the species of *Osmia* referred to; but subsequently the same diligent observer reared both sexes of this *Halticella* from the briar-cells of *Osmia tridentata* ('Annales,' 1879; Bulletin, p. xliii); still referring thereto as the "*Euchalcis vetusta* que l'on n'avait pas signalé, en France du moins, depuis 1815." He made no mention, however, on either occasion, of his specimens differing from Dufour's diagnosis, as aforesaid; while recognising them as identical with those of *H. osmicida*; adding, that my observations on their economy were "absolument analogues" to his own.

M. André now figures this French species, in default of any other, as the genuine representative and antitype of the long-lost Spanish original; admitting, however, that "la description de Dufour indique des *écaillettes rouges* et des *pattes noires*; l'insecte représenté possède au contraire des *écaillettes très noires* et des *cuisses rouges*!" He suggests the following explanation of this discrepancy. Speaking of the Spanish type, he says:—"C'est sans doute une variété curieuse, ou peut-être une erreur de copie du Dufour, qui, au moment de la publication de cette espèce, en 1861, ne l'avait plus sous les yeux depuis 1815, et ne pouvait se reporter qu'à des notes conservées depuis cette époque et peut-être incomplètes."

It would seem somewhat gratuitous to treat the described Spanish prototype as a curious variety, and to substitute in its stead a French species essentially divergent therefrom; nor less so to suppose that, by

some possible clerical error, Dufour, habitually so precise, should have transcribed red for black, and black for red; nor can it be deemed more plausible that, while carefully recording in his notes the minutest details and specially adverting to the posterior femora, he should have omitted to define their most striking characteristic! Moreover, to sink the described species to an aberrant qualification would render its diagnosis abortive and illusory. Why, indeed, should not Dufour's *E. vetusta*, coinciding therewith, occur again on the banks of the Ebro? Has anyone, in France or elsewhere, reared such a so-called "variety" commingled with others corresponding with its ideal representative? Do we even know that the Spanish specimen was nurtured by the same species of bee? What then can be held to justify such a transfiguration; rather than regard Dufour's type—of different origin and unknown life-history, completing also its metamorphoses at an earlier period (March instead of June)—as essentially distinct from the species now inaugurated in its stead?

Let us listen, however, to Dufour's arguments in a strictly parallel case recorded in the same Mémoire of 1861, when, adverting to the *C. Dargelasii*, confounded by Latreille with the *C. rufipes*, Oliv., Dufour remarks:—"Quant à la couleur de ces grosses cuisses d'un *rouge ferrugineux* qui *saute aux yeux*, Olivier *n'eût pas manqué de la signaler si elle avait existé dans son espèce*, et il a gardé le silence" (*loc. cit.*, p. 10). We have only to read Dufour for Olivier, and the application is perfect. Can we then attribute such palpable inconsistency to the inspired writer of these words? Do they not convey—as it were by anticipation—his indignant protest against such an incredible oversight being imputed to him? What, indeed! Commit the same blunder himself on the one page, which he repudiates in Olivier on the next! His attention had been thus forcibly called to the very point now at issue, as regards the presence or the absence of those *conspicuous red femora* which, according to his own dictum, he could not have failed to indicate in his recorded notes had such existed; yet, like Olivier, *il a gardé le silence!*

But, irrespective of this, I would ask—By what criterion are we to be guided in works of reference, if not by the authoritative descriptions originally supplied for this purpose? Are we, as in this instance, to

supersede the text by exhibiting, as a standard of comparison, any figure which may be hypothetically ascribed to a lost type, though confessedly at variance with the authentic record? Are we, in such cases, in accordance with this new doctrine, liable to have primary definitions transmuted, *ad libitum*, to suit any other species of suppositious identity by fanciful illustrations of the one for the other? Yet such is the avowed object which our worthy colleague proposes to attain:—"C'est pour fixer définitivement cette espèce que j'ai cru utile d'en donner le dessin"!

In so novel a case some may be tempted to enquire how such fixity of tenure in the domain of science can be definitively conferred upon any interloper, in striking contrast to the immutable precepts of the original diagnosis—or how conjectural disquisitions of casual inference can serve to influence the development of such a theory? Moreover, how can Dufour's record be questioned in this instance, after his own comments as aforesaid? At all events his definition must be taken for what it is worth, and duly respected as a legitimate title which cannot be infringed; so that no such process as that now resorted to can avail to instal an incongruous substitute in the lapsed estate of the titular absentee!

By some inadvertence, however, M. André cites Dufour's species as *Halticella venusta* = *Euchalcis venusta* (p. 340), under which name he has also figured the French species (p. 344); while, by a curious coindence, the *H. osmicida*, male and female, were figured by Mr. C. O. Waterhouse, in the course of last year, in his 'Aid for the Identification of Insects' (part v., plate 40). If, therefore, the French species be really identical with the latter, as alleged, the names respectively assigned thereto in these figures are obviously synonymous, without in any way detracting from the prior claims of Dufour's type, irreconcilable with either.

I have deemed it requisite to offer these remarks in self-justification for having characterised the *Halticella osmicida* as a new species in 1873; while I avail myself of this occasion to furnish a more detailed description of the antennæ and abdomen, with reference more especially to the terminal segments hereinafter adverted to.

Note.—In *Halticellæ osmicidæ* diagnose (*loc. cit.*, 1873) lege ut seguitur:—*Antennæ* utroque sexu *11-articulatæ*, geniculatæ; scapo fere recto, in sulco faciei depresso, capitis longitudine; articulo 2do parvo, basi constricto, recurvo; 3tio minimo, transverso; 4to sensim latiore, sequentibus parum longiore; reliquis fere coæqualibus, subquadratis; extimo conico. *Abdomen* basi subtilissime punctatum; *maris* ovatum, nigrum, segmentis 7tem, extimo basi utrinque spiraculifero; *feminæ* elongato-conicum, segmentis (absque cauda ventrali) sex, quorum tribus vel quatuor basalibus lucentibus rufis, parce punctatis; reliquis cum cauda nigris; 6to (epipygio, Sichel) longiore, deflexo, crasse punctato, prope basin utrinque puncto spiraculiformi parvo rotundo oblique instructo. Cauda (Sichel) ab hypopygii apice terebram involvente composita, scabriuscula, superne utrinque spiraculifera; terebræ valvularum compressarum apice subtrigono, rugoso, subtus producto; terebra ipsa parum longiore. Segmentis dorsalibus valde deflexis, prominulis, ventralibus ab illis fere obtectis.

[Part II.—Read March 1st, 1882.]

In referring, at our last meeting, to M. Edmond André's recent Mémoire on the Genus *Chalcis* of Fabricius, I abstained from entering into certain intricate details respecting the caudiform appendages of the females, whose anomalous characters were elaborately discussed by the late Dr. Sichel in his 'Monographie des genres *Phasganophora*, Westwood, et *Conura*, Spinola,' in the Annales of the French Entomological Society for 1865 (4e série, tome v., p. 345; pl. 9, figs. 4 and 5, a—g; pl. 10, fig. 1, *a*, *b*, *g*).

This distinguished writer points out that "Le genre *Phasganophora* est principalement charactérisé par une modification très-rémarquable et singulière de l'abdomen des femelles, ou, pour être plus précis, de la valvule anale inférieure (*hypopygium*). Celle-ci se prolonge beaucoup en arrière; concave à sa face inférieure, convexe et fermée à sa face supérieure, comprimée sur les côtés, elle enveloppe la tarière, qui ne reste découverte que dans une portion plus ou moins longue de son extrémité postérieure. Cette conformation particulière de l'hypopygium n'existe dans aucun autre genre d'Hyménoptères" (p. 350).

The terminal dorsal and ventral segments (epipygium and hypopygium) are thus conjoined; the latter, enveloping the terebra and its sheaths, being grasped firmly by the former towards its apex, as though constituting a continuous portion of the dorsum itself; thereby inducing an illusory persuasion that the epipygium must exist in proximity to the apical extremity of this caudal appendage (*cauda*, Sichel), rather than in an intermediate position as aforesaid. Dr. Sichel has shown that the true *epipygium* in the females is always next in succession to the 5th segment, although the divisional boundaries of the respective segments are sometimes so imperceptibly defined as to lead to erroneous conclusions of their numerical position in the series.* It is the last

* *Note.*—Dr. Sichel explains, by the insertion of an additional paragraph (p. 386), that in *Conura flavicans* and *scutellaris*, Spinola was deceived like himself; "parceque les limites des deux premiers segments étaient indistinctes et confondues dans nos deux exemplaires. Dans la figure de Spinola (Mag. de Zoologie, 1837,

dorsal segment, abutting on a narrow impunctate belt appertaining to the hypopygium, where their union is effected as aforesaid.

Each of these terminal segments, thus conjoined together in the *females*, is furnished with a pair of spiracles, seen in succession from above, and first recorded by Prof. Westwood in his figure and description of *Chalcis pyramidea*, Fab. (Trans. Ent. Soc. Lond. vol. ii. p. 224; pl. xx., fig. 6 *a*); those of the epipygium (6th segment, Sichel) being rotundate, and located close to the base on each side; those of the hypopygium, elongate-oval, situated towards the projecting apex above, in proximity to the aforesaid impunctate belt, while separated *inter se* by a slightly carinated ridge. In the *males*, however, where the terminal segments retain their normal condition, the 7th dorsal segment (*epipygium*) is alone furnished with its usual spiracles, the hypopygium below having none.

M. André, however, does not seem to be fully persuaded of the peculiar conformation of these terminal segments in the female, or of the conjunction of this caudal appendage with the epipygium in succession thereto, when he denounces, as "une erreur commise involontairement par le docteur Sichel," that, by some strange misconception of the text and figure of Prof. Westwood (*loc. cit.*), the former "semble reconnaitre en effet la présence de stigmates à la base (?) de ce qu'il appelle l'*hypopygium*, qui est en réalité le 7e arceau ventral de l'abdomen" (p. 334). M. André contends that "Celui-ci considérant en effet, avec raison, que les parties que le docteur Sichel appelle *epipygium* et *hypopygium* constituent par leur ensemble un seul segment abdominal—le dernier visible, dit: '*Abdominis segmentis duobus apicalibus utrinque puncto spiraculiformi, ut in generibus Ibalia et Leucospide*';" while—as our esteemed colleague conceives—"la figure explique surabondamment que '*segmentis duobus*' s'applique à l'*epipygium* de Sichel et *au segment dorsal qui le précède*, mais nullement à son *hypopygium*. Celui-ci n'en présente, par le fait, aucune trace, ou du moins je n'ai pu en découvrir"!

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pl. 180) les deux premiers segments sont représentés comme n'en formant qu'un seul; ce qui y parait le cinquième segment est en réalité l'épipygium. Ce que j'ai regardé dans ces deux espèces comme l'épipygium est l'hypopygium."

In the aforesaid figure, however, the two spiracle-bearing segments adverted to by Prof. Westwood are the 6th and 7th in the order of progression (and not the 5th and 6th); the former corresponding with the spiraculiferous "*épipygium de Sichel*," and the latter with his subjacent *hypopygium*, projecting beyond, and followed by the terebra and its demi-sheaths. Moreover, in all Dr. Sichel's described species (*loc. cit.*) the *first pair* of spiracles is invariably associated with the *sixth* or terminal dorsal segment in the females, and the *second pair* with that portion of the caudal process next in succession thereto; the structure of which is thus defined by Dr. Sichel (p. 355) :—

"Cet organe est composé de trois parties :

"1. La *valvule anale supérieure* (*épipygium*, pl. 9, fig. 4, *a*, *b*; 5, *a*, *b*; pl. 10, fig. 1, *a*, *b*) est très-convexe et quelquefois un peu bossuée. Son bord postérieur est étroitement appliqué à la valvule anale inférieure, sans y être soudé, si ce n'est exceptionellement. Tout près de sa base, elle porte de chaque côté un stigmate (spiracle) arrondi. M. Westwood (*loc. cit.*) a été le premier à indiquer l'existence de ce stigmate et de celui du bout de l'hypopygium.

"2. La *valvule anale inférieure* (*hypopygium*), convexe en haut, concave et creusée à sa face inférieure, très-comprimée en forme de gaîne, remonte des deux côtés de la tarière en se recourbant au dessus d'elle, de maniére à l'envelopper en entier et la cacher dans une très grande étendue, dans plusieurs espèces presque jusqu'à son extrémité postérieure. Tout près de son apex, l'hypopygium (ou fourreau de la tarière et de sa gaîne) porte de chaque côté un stigmate ovalaire. A sa face inférieure, ses bords libres se joignent et s'appliquent si étroitement l'un à l'autre, que cette face paraît fermée à peu près dans l'étendue de l'épipygium, puis, à partir du bord postérieur de celui-ci, à peine fendue par une étroite rainure linéaire jusqu'à son extrémité postérieure.

"3. La *tarière* (*terebra*, *oviscaptus*), composée de ses gaines ou valves, comprimée et, selon les espèces, droite ou un peu recourbée à son extrémité postérieure. Entre les valves se trouve logée la tarière elle-même."

It should, however, be observed that M. André entertains certain divergent views as to the *7th dorsal* and *ventral segments* respectively, whereby these are considered to represent what he terms the "*épipygium* et

hypopygium de Sichel," as enunciated from time to time. Thus, in the passage already referred to, where he first speaks of the "*hypopygium* qui est en réalité le *7e arceau ventral* de l'abdomen" (p. 334); and again, on the following page, when he adverts to the "*7e segment abdominal*" as corresponding with the "*épipygium* et *hypopygium* de Sichel"; he shortly afterwards discusses the relative length of the "arceaux *dorsal* et *ventral* du *7e segment*,' in *Chalcis minuta*; and subsequently notices "la présence, dans les *Phasganophora*, *d'une paire de stigmates sur le 7e arceau dorsal*," which, he adds, "se retrouvent exactement avec les mêmes dispositions chez toutes les espèces de *Chalcis*" (p. 336).

In all these instances M. André is presumably speaking of the *females*, or of both sexes, in the former of which the *6th* terminal dorsal segment represents this "*épipygium de Sichel*," *the 7th having no existence at all*; and the projecting apex of the hypopygium presenting only the *semblance* of an additional dorsal segment. In testifying, therefore, indiscriminately to the existence of these spiracles "*sur le 7e arceau dorsal*," M. André unconsciously avows the recognition of the *spiraculiferous apex* of this "*hypopygium de Sichel*," which he so strenuously repudiated before. On the other hand, it is mysteriously suggested in a footnote that "Les véritables *epipygium* et *hypopygium* sont les deux arceaux du *8e* segment abdominal, invisible et tout à fait transformé chez les Chalcidites" (p. 334); thus recognising also that complicated transformation of these terminal segments which Dr. Sichel alone has endeavoured to elucidate.

Towards the close of his Mémoire, however, M. André has thrown a new light upon this subject in describing two species of *Smicra* (*S. picta* and *S. flavescens*), both females, the abdomen of the former having the "*7e segment prolongé en forme de queue*, son *arceau ventral* (*hypopygium* de Sichel) *plus long* que l'*arceau dorsal*" (p. 342). In the second species no mention is made of these terminal segments. Some clue is thus afforded to the signification attached to this suppositious "*7e segment*" by its component parts, as aforesaid the latter and *shorter* of which, in succession to the 6th segment, being obviously the *apical portion* of the *true hypopygium* (Sichel); while the former, *plus long*, can be no other than the *terminal portion* of the *projecting terebral*

sheaths, which have been here apparently confounded with the "*hypopygium* de Sichel," as the supposed "*arceau ventral*" where all search for *spiracles* had proved unavailing; the spiraculiferous apex of the *true hypopygium* (Sichel) being thus ascribed to the *epipygium*, or supposed "*arceau dorsal*" of a non-existent "*7e segment*," and the *true epipygium* (Sichel) being regarded as the "*segment dorsal qui le précède*."

Walker, in his 'Notes on Chalcidiæ,' says that "*Phasganophora* and *Halticella* agree in general structure" (p. 40); and this is more especially witnessed in Dr. Sichel's subgenus *Allocera* (Ann. 1865, p. 379), founded on a single example from Algiers (*A. bicolor*, Sichel, ♀; = *Euchalcis Miegii*, Dufour, Ann. 1881, pl. 1, fig. 4), which exhibits all the generic characteristics of *H. osmicida*, though specifically distinct. Thus, in the latter, the dorsal segments of the abdomen are laterally prolonged into a series of overhanging flaps, which conceal the ventral region to a considerable extent. Speaking of these in *Allocera*, Dr. Sichel says, "Les arceaux ventraux sont si courts et couverts dans une si grande étendue par les arceaux dorsaux, qu'on les voit à peine" (p. 380). The contracted basal portion of this ventral region is depressed far below the rest in the guise of a carinated recess, open posteriorly, and not extending beyond the third dorsal segment; its sloping sides, of translucent flexible consistency, indicating, in the same species, four or five overlapping segmental divisions firmly welded together, the terminal segment of these being considerably longer than the others. In *Chalcis pyramidea*, Fab., *five* of these segments are shown (Westwood, *loc. cit.*); whereas in *C. Gallica*, Sichel, the whole of the ventral segments are described by Dr. Sichel as "*fere in carinam compressa, rufa, tennia, semipellucida, subconnata, ita ut ultima unicum tantum segmentum, ab hypopygio valde distans et vaginam amplam effingens, constituant*" (*loc. cit.*, p. 373). By the angular gap at the termination of the aforesaid carinated recess, free action is afforded to the terebra from within; this aperture being apparently closed at will by bringing the hypopygium more or less into contact with the salient angle below, as witnessed in some specimens, and doubtless also by the closer conjunction of the projecting dorsal flaps, described by Dr. Sichel (in his *Allocera* = *Halticella*) as "omnium lateribus in ventrem decur-

rentibus, ibique secundum lineam longitudinalem juxtapositis et circa hypopygii basin segmentaque ventralia brevia subnulla junctis" (*loc. cit.*, p. 380).

The general structure of the abdomen and its appendages in *Halticella osmicida* will be best explained by exhibiting the different sectional parts under various aspects. The importance of such illustrations had not escaped the notice of Dr. Sichel, who states—"J'ai essayé de disséquer toutes ces parties mais je n'y ai réussi que très-imparfaitement sur mes individus désséchés depuis longtemps et difficiles à ramollir et à manièr" (p. 354).

In the figures which M. André has supplied of the terminal segments in several species, the corresponding parts whereof are not cited in the *females* (figs. 1 *b*, 2 *f*, 2 *g*), the two spiraculiferous segments of his *Halticella renusta* ♀, represented in 2 *f* and 2 *g*, obviously coincide with the *epipygium* (Sichel) and *hypopygium* (Sichel) respectively,—the terebral sheaths projecting beyond the latter,—however difficult it may be to reconcile this with his remarks thereon. It must also be assumed that his figure 1 *b* indicates the same relative parts in *Chalcis Gallica*, Sichel, ♀. As to his presumed *males* (3 *c*, 4, and 5)—the sex being defined in the first only,—they have been credited in each instance with the full complement of *two pairs of spiracles*; and when speaking of these in *Phasganophora* and *Chalcis* M. André observes—"Les stigmates se retrouvent comme dans les femelles" (p. 336); although, in so far as hitherto recorded, the spiracles in this sex are limited to *one pair* on the terminal or 7th segment (*epipygium*);* which I am now enabled to corroborate as regards the males of *H. osmicida*.

In the accompanying details of the latter, Plate xii., fig. 1 exhibits the dorsal segments of the abdomen in the female, removed in one connected series, terminating with the 6th (*epipygium*, Sichel), seen laterally. In fig. 2 the contracted ventral segments are retained within the overlapping range of the former; the apical portion, in this instance, having been detached from

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* "*Epipygium minimum, compresso-convexum, basi utrinque spiraculo fere totum latus occupante notatum. Hypopygium itidem minutum, compresso-convexum, sed spiraculo carens. ♂ tres.*" (Sichel in *Phasganophora variegata*, loc. cit., p. 380).

within the ventral recess. Fig. 3 gives the residuary portion of the ventral region in the foregoing; consisting of the *hypopygium* (Sichel) intimately associated with the *terebra* and its appendages, whose sheaths are here withdrawn from the former and separated, showing the terebra with its spiculæ in the intermediate space. Thus the hypopygium extends to the apex, in the absence of the usually projecting terebral sheaths; which, narrow at their origin and laterally compressed, gradually widen beyond their centre, changing colour from rufo-flavous to jet-black. At the basal extremity of the abdomen the subjacent terebral sheaths are reflexed back upon the dorsum, where the latter are dilated into two oval lateral circuits; beyond which, on the dorsal region, the epipygium, usually firmly attached to the impunctate transverse belt of the hypopygium, as if appertaining thereto, is here partially raised to exhibit the component parts of the latter; whose spiracles, on either side of its carinated apex, in other instances oval, are here circular, and closely follow the aforesaid belt, as in fig. 6.

The ventral region, reversed and seen laterally, is shown entire in fig. 4; the terebra reposing within the elongate channel of the hypopygium and its closed sheaths projecting to the extreme apex. The epipygium has also been retained *in situ* above. In fig. 5 the ventral region reversed is seen from behind, showing the basal recess; the terebra with its spiculæ being alone displayed, and its sheaths closed. The terminal portion of the same, seen from above, is shown in fig. 6, commencing with the impunctate transverse belt of the hypopygium, and terminating with the terebral sheaths. These sheaths, together with the terebra and its spiculæ fully displayed, are exhibited in fig. 7. The abdomen of the *male*, as seen from below, and the terminal segments of the same seen from above, are represented in figs. 8 and 9, and the corresponding segments of the female, as seen intact from above, are exhibited in fig. 10, commencing with the 5th; the last dorsal segment (*epipygium*, Sichel) being next in succession; closely followed by the impunctate belt of the terminal ventral segment (*hypopygium*, Sichel), and by the spiracles of the latter, separated *inter se* by the carinated ridge extending to its apex; the closed sheaths of the oviduct projecting beyond, with the extremity of

the terebra protruding between them. The hypopygium, and the terebra with its adjuncts are shown disengaged from each other in figs. 11 and 12. The apex of the former highly magnified (fig. 13) has been casually severed along the carinated ridge, where no suture exists; but being brittle and deflexed around the sheaths, when these are withdrawn from the longitudinal channel below it readily yields along this line, as here exhibited. The antenna of the female (with which that of the male closely corresponds, on a smaller scale) is shown in fig. 14; the fore and hind wings in figs. 15 and 16; and the posterior leg, in the same sex, with its incrassated internally serrate femur and minute tibial calcaria, in fig. 17; a similar structure, without the serrate margin, existing in the male.

With respect to the old genus *Chalcis*, our honoured colleague states that, after vainly seeking to discover some better definitions between this and *Phasganophora* than the unisexual character of the caudal appendages in the latter, he had unexpectedly been led to a conviction directly contrary to his expectations, compelling him to unite those genera together, as presenting intermediate transitions which rendered it difficult to determine the respective limits of each. Having come to this conclusion, he soon found that similar transitions among the species of the genus *Conura* irresistibly led to their absorption in like manner; some with *Chalcis*, and others, having a petiolated abdomen, being readily affiliated to the genus *Smicra* of Spinola; while the genus *Halticella* of Spinola, having the antennæ inserted near the mouth instead of at the vertex, served as a rallying point for others detached from *Phasganophora*. Thus, as M. André explains, "les trois genres *Chalcis*, *Smicra*, et *Halticella*, renferment chacun une série d'espèces à segments postérieurs de l'abdomen prolongés plus ou moins, quelquefois d'une façon démesurée, mais sans que l'on puisse les séparer d'une façon nette de toutes les autres" (p. 337).

No satisfactory result has thus been obtained by disregarding the characters of the terminal segments; and in fact, when limiting these subdivisions to *three*—whose prominent attributions are equally unstable, and involving therefore the same inherent defects—the arguments propounded as aforesaid must be no less available to debar these groups from any such privileged exemption.

On the other hand, the recognition of sectional distinctions and subsidiary alliances is of no mean value amid an extensive series of divergent types, which must otherwise entail inextricable confusion in the absence of such discriminating tests.

Dr. Sichel has remarked that, setting aside the peculiar conformation of their terminal segments, "les *Phasganophora* resemblent aux autres *Chalcidoïdes*,et pourraient même être réparties comme sous-genres dans cette tribu, dont la plupart des genres auraient ainsi leurs représentants et leurs sous-genres correspondants dans toutes les coupes génériques de l'ancien genre *Chalcis*. Ainsi on pourrait entrevoir dès à présent qu'il existe des *Phasganophora* à antennes insérées au milieu du front et à pétiole allongé (*P. smicriformes*)—ou court et presque nul (*P. chalcidiformes*)—et d'autres à antennes insérées près de labouche (*P. halticelliformes*)" (p. 350). But he could see no reason in this for abolishing those genera whose characters are founded on sexual distinctions; while—as he pathetically adds—"personne cependant n'a songé à les supprimer" (p. 351). He also elsewhere observes—"Toutefois il y a, comme toujours entre les genres voisins, certaines transitions qui pourront quelquefois rendre la distinction difficile quand le nombre des espèces sera devenu plus considérable" (p. 385); but it can hardly be alleged that the greater the number of species the less the need of sectional divisions, or that it will become the more expedient to amalgamate them all together on account of such presumable transitions!

Walker, in his 'Notes on Chalcidiæ,' when commenting on *Halticella* and its allies, observes that "the species are numerous, and there are many which agree with Dr. Sichel's definition of *Phasganophora*"; but he anticipates a very different result therefrom when he considers it "probable that in process of time the species of this family will be partitioned among an excessive number of new genera" (p. 40).

It must at any rate be obvious that, where habits are more or less identical, structural affinities afford the best test and true criterion of natural alliances, the guiding principle being to determine this result by means of such an index; and when, as in this instance, the pioneers of progress have recognised special distinctive characters, to abandon this vantage ground by retrograding

into the annals of the past, and by incorporating heterogeneous types with a host of others as in the infancy of scientific research, would be less befitting than to eliminate disturbing elements by affording a new status to any of the former which may stand in need thereof.

Explanation of Plate XII.

DETAILS OF *HALTICELLA OSMICIDA*.

Fig. 1. Dorsal segments of abdomen in female, entire.
2. Basal segments of dorsum reversed, showing the ventra segments within.
3. Hypopygium (Sichel) and ovipositor conjoined.
4. Ventral region, seen laterally.
5. Ditto, from behind; the terebra and spiculæ displayed.
6. Apex of preceding, seen from above ("*Cauda*," Sichel).
7. Terebra with sheaths and spiculæ displayed *in situ*.
8. Abdomen of male; ventral region.
9. Terminal segments of ditto, seen from above.
10. Ditto of female, seen from above.
11. Ovipositor, apart.
12. Hypopygium apart, seen from below.
13. Apex of hypopygium, highly magnified.
14. Antenna of female.
15. Fore wing of ditto.
16. Hind wing of ditto.
17. Posterior leg of ditto.

Note.—In the foregoing figures the various segments (1—10), and fig. 13, are magnified 9½ diameters; the remainder, 11, 12 and 14—17, 6 diameters.—G. S. S.

XII. *On the supposed abnormal habits of certain species of* Eurytomides, *a group of the Hymenopterous family* Chalcididæ. By J. O. Westwood, M.A., F.L.S., &c.

[Read May 3rd, 1882.]

Plates XIII. and XIV.

In the memoir on the insects infesting the seeds of *Ficus Sycomorus* and *Carica*, recently published (Trans. Ent. Soc. Lond., 1882, pp. 47—60), I have suggested that notwithstanding the phytophagous character of the two remarkable insects, *Sycophaga crassipes* and *Blastophaga Psenes*, they were more nearly related to the entomophagous *Chalcididæ* than to any other family of Hymenoptera. The question of the possibility of so close a relationship between animals differing so widely as to possess phytophagous and sarcophagous habits is one of great physiological interest, and appears to be affirmed not only by the case of the *Cynipidæ* alluded to in my memoir, as well as by that of *Bombus* and *Psithyrus*, but also by the various instances of phytophagism stated to have been observed in certain species of the *Eurytomides*, whilst others in the latter group have certainly been ascertained to be entomophagous in their habits. It is true that the phytophagism of *Eurytoma hordei* and its immediate allies has been questioned and again reaffirmed, so that a very careful examination of the statements made on either side is required, and I now beg leave to lay the result of my examination of the chief authorities upon this curious question before the members of the Entomological Society without prejudging their verdict, which may, however, I think, now be given.

The late Mr. F. Walker published a Monograph of the British *Eurytomides* in the first volume of the 'Entomological Magazine' (October, 1832). In this memoir four genera are described—1, *Isosoma*, Walk., with twenty-three species; 2, *Systole*, Walk., one species; 3, *Eurytoma*, Illiger, eleven species; and *Decatoma*, Spinola, ten species. Almost all the species are described as having

been taken amongst grass beneath trees, the only novel remark on the economy of the species being that Mr. Davies had obtained an individual of the genus *Decatoma* from an oak-gall. In the second volume of the same magazine Mr. Walker adds descriptions of one additional species of *Isosoma*, one of *Systole*, five of *Eurytoma* (one of which, *E. salicis*, was reared by M. F. de Laporte from galls on willows near Paris), and two of *Decatoma*. And in the fourth volume of the same work three additional species of *Isosoma*, one *Eurytoma*, and three of *Decatoma* were described by Mr. Walker, with no account of the economy of any of the species.

C. G. Nees ab Esenbeck, in the second volume of his 'Hymenopterorum Ichneumonibus affinium Monographiæ,' 1834, has described eight species of *Eurytoma*, with the general observation:— "Habitat in Carduis, Artemisiis aliisque herbis et fruticibus, ubi gallas fungosas ictu suo gignere dicuntur hujus generis species. Adnot. Latreillium et Dalmanum secutus *Eurytomæ* genus inter Pteromalinos posui, quibus re vera habitu notisque ex antennis alisque haustis proxime conjunctum videtur; sed vitæ ratio Cyniphum potius est, quibus Eucharide genere medio conciliatur, neque errabit, qui, utriusque ordinis, Cyniphum et Pteromalinorum inquam, novo certiorique charactere invento, Eurytomas Cyniphibus restituet" (*op. cit.*, pp. 38 & 39).

The following are the species of which the economy is recorded by this author:—

Eurytoma plumata, Illiger (*serratulæ*, Fab.; ♀, *compressa*, Fab.; *adonidum*, Rossi). "Habitat in galla lignea polythalama, rotundata, utrinque attenuata, caulis *Serratulæ arvensis* galliæ (Fabricius, auctoritate Musei Bosciani"* (p. 40).

E. Abrotani, Illig., Panz. (*P. appendigaster*, Swederus; ♀, *aterrimus*, Schrank; *P. nigritus*, Swederus). "In Galla caulis cujusdam tuberosa, plantæ ab hieme destructæ ideoque incertæ, Parietariæ forte, copiam feminarum invenit Schrankius. In Carduis proper Sickershausen Julio, Augusto et Septembre mensibus, ipse legi; marem fœminæ copula junctum die 21 Aug. a. 1821; in variis

* According to Bouché, Naturg. d. Ins. i., p. 166, n. 58, the larva is "elongato-cylindrica, subtiliter undulata, incisuris profundis segmentis dorsalibus gibbosulis, capite subgloboso. Long. lin. 1. Habitat in larvis *Microgasteris liparidis*, Bouché, et in iisdem metamorphosin subit."

plantis prope Norimbergam, Panzer; prope Viennam inventa est; etiam in Gallia et Suecia" (p. 41). And in the Addenda, p. 415, it is further stated:—"Habitat in Gallis Cyniphis Potentillæ mihi, Februario mense anni 1834, in horto botanico Vratislaviensi lectis. Exclusis primum inde a die 26 Martii Cyniphibus plurimis utriusque sexus, mox etiam Eurytomæ multæ prodiere."

E. verticillata, Illig., Fabr. (*abrotani*, Fonscol.) "Cepi mares et feminas promiscue, in variis floribus vere et æstate prope Sickershausen. Feminam, in galla parva globosa sanguinea Folii Rosæ insidentem, misit cl. Gravenhorst, hoc situ a sese prope Brunsvicum captam" (p. 41).

E. ænea, Esenb. (*Decatoma metallica*, Spinola. "Unam hujus speciei feminam cepi, Aphidibus, jam mortuis, Aphidio vario impraegnatis, terebra immissa ova imponentem, die 11 Junii a. 1813, in Rosa horti mei prope Sickershausen. Marem non vidi" (p. 42).

E. signata, Esenb. "Plura hujus speciei exempla utriusque ea variationis, prodiere diebus 12 et 13 Julii a. 1809 e Galla *Cyniphis Quercus gemmæ*, Linn. prope Sickershausen lecta. Alia cepi, Augusto mense locis nemorosis, in quercu. Observavi etiam Septembre mense hujus speciei feminam, cum gallam illam orbiculatam depressam lenticularem umbonatam basi arcte appressam rubram hirsutam, quæ in pagina foliorum quercus inferiori frequens occurrit, ictu vulneraret. Non causa igitur hujus gemmæ, sed parasita incolæ ejus videtur" (p. 43).

E. rosæ, Esenb. (Addenda, p. 415). "Habitat solitaria in gallis parvis globosis lævibus pisi magnitudine, primum pallidis, alterove latere roseis, demum lutescentibus, quæ prima æstate in pagina inferiori foliorum Rosæ centifoliæ horti mei Vratislavensis natæ, ad unam omnes hanc Eurytomam, nullam autem usquam Cyniphem edidere, neque spolia larvæ destructæ, quotquot dissecui, monstravere ut, itaque mihi persuasum sit, gallas istas ab ipsa *Eurytoma matre* ictu plantæ esse genitas ovuloque imposito impregnatas; ad hanc speciem referas feminam illam a cl. Gravenhorst in simili galla captam" (p. 41).

In his 'Hymenopterologische Studien' (2 Heft, 4to, 1856, p. 44), Förster has criticised Walker's distribution of the family, and given another tabulation of the four genera, without adding anything to our knowledge of the habits of the species.

Herr Förster (Beitr. z. Monogr. der Pteromalinen,

1 Heft, 4to, 1841, p. 6) comments upon Nees von Esenbeck's account of the habits of these insects as follows:—

E. signata, N. "Diese Art erzog ich aus denselben Gallen, wie Nees, und mit denselben zugleich *Pteromalus fasciculatus* und *sodalis* nob. sehr häufig. Weniger häufig erschienen aus denselben Gallen *Neuroterus petiolatus*, Kaltenbach, *Synergus rufiventris*, Kalt., und *Synergus parvus*, Kalt.; der erste ist also der Bewohner der Galle, während die beiden *Pteromalus*, die beiden *Synergus* und die *Eurytoma signata*, welche ich auch aus den vielkammerigen Schwammgallen an den Eichenzweigen mit *Teras terminalis*, Hart., erhielt; also im Ganzen 5 Parasitem nur als Zerstörer desselben angesehen werden müssen. Daraus geht mit Gewissheit hervor, dass Eurytoma keine Gallen erzeuge."

E. abrotani, Ill. "Ich selbst erhielt diese Art aus Eichenblattgallen, welche wahrscheinlich der *Cynips disticha* angehören."

E. rosæ, N. "Es scheint dies aber wirklich nicht der Fall zu seyn, denn ich erhielt dieselbe Art zwar aus Rosen, aber auch aus Blattgallen von derselben Grösse auf *Acer platanoides*. Diese letzeren Gallen waren von *Andricus scutellaris*, Kalt. bewohnt, in welchem *Pteromalus jucundus* nob. und *Pterom., fasciculatus* nob. parasitisch leben. Es findet also hier wie bei *E. signata* desselbe Verhaltniss statt, beide müssen Parasiten seyn, weil sie sonst wie oben von zweierlei Gallen wären."

In the appendix to this 'Beitrage,' Förster has described eight new species of *Eurytoma*.

The late Dr. Thaddeus William Harris devoted not fewer than ten pages in the second edition of his 'Treatise on some of the Insects of New England which are injurious to Vegetation' (8vo, 1852, pp. 437), giving an account of a species of *Eurytoma* (*E. hordei*) which was supposed to have proved very injurious to the barley crops in the United States by forming gall-like swellings on the straw of barley and wheat, which prevent the proper development of the plants; hence called barley-straw insects and joint worms. The following is a very concise abstract of Dr. Harris's account:—These insects were first observed in 1829 and 1830, and on some farms the crop of grain scarcely exceeded the quantity of seed sown; most of the stalks were found to have a number of small worms within them near to the second joint, which had become hardened in the part attacked from the

interruption of the circulation of the sap, and in some places the cultivation of barley was given up in consequence thereof. When the barley is about eight or ten inches high the effects of the disease begin to be visible by a sudden check in the growth of the plants and the yellow colour of the lower leaves. If the butts of the straw are now examined they will be found to be irregularly swollen and discoloured between the second and third joints, and instead of being hollow are rendered solid, hard, and brittle, so that the stem above the diseased part is impoverished and seldom produces any grain. The worms are about one-tenth of an inch in length and of a golden or straw-colour, and in the month of November they appeared to have passed to the chrysalis state, which extends through the winter. In some cases the larva entered the pupa state early in the spring, and the perfect insects began to make their appearance on the 15th of June, escaping through minute perforations in the straw which they gnawed for this purpose. These larvæ differ entirely from those of *Cecidomyia* (which latter had been supposed by certain writers to have been the real cause of the mischief) in having the bodies softer and their skins more delicate and tender, whilst the form of the head and structure of the mouth are entirely unlike those of the Cecidomyian larvæ; the head is round and partially retractile; the jaws are lateral and hooked, they meet at the points, and are of a blackish colour, and apparently of a horny texture, being distinctly visible even with a pocket microscope; hence it is evident that these larvæ are hymenopterous, "and are not the larvæ of any dipterous insect." The perfect insects thus obtained proved to belong to the genus *Eurytoma*, and were described by Dr. Harris in the 'New England Farmer' for July 23rd, 1830 (vol. ix., p. 2), and in the first edition of his 'Treatise' as *Eurytoma hordei*. Eight years previously seme of these insects, that came from a straw-bed in Cambridge (Mass.), were shown to Dr. Harris. They had proved very troublesome to children sleeping on the bed, their bites or stings being followed by considerable irritation and inflammation, which lasted several days; so numerous were the insects that it was found necessary to empty the bed-tick and burn the straw.

In 1851 the ravages of the joint worm in the wheat fields of Virginia attracted the attention of Dr. Fitch,

whose observations thereon appeared in 'The Cultivator' for October of that year. The disease in this case was found to be situated immediately above the lower joint in the sheathing base of the leaf, the substance of which, for a distance exceeding half an inch, was much swollen, and was changed to a more solid and wood-like texture, whilst the surface exhibited several long pale spots, slightly elevated like a blister. The hollow of the stem was entirely obliterated at some parts by the pressure of the enlarged portion of the sheath, and was hardly visible at others. Each of the blistered spots covered an elongated cavity, containing a footless worm or maggot about ten-hundredths of an inch long, of an oval form, rather more tapering posteriorly than towards the head, and divided by slight constrictions into thirteen segments. The worm was soft, shining, of an uniform milk-white colour, with a small V-shaped brown line marking the situation of the mouth. "So exactly," remarks Dr. Fitch, "does this worm in its form and appearance resemble the larvæ of the Hessian fly and other species of *Cecidomyia* which have fallen under my examination, that I entertain no doubt it pertains to the same genus of insects." A number of specimens of the diseased wheat were submitted to Drs. Harris and Fitch for investigation, the former of whom only obtained specimens of *Eurytoma* from them, all with one exception being females; whilst Dr. Fitch obtained above one hundred specimens of the same *Eurytoma*, all of which were females. The former observer obtained also one Chalcidian parasite belonging to the genus *Pteromalus*, whilst the latter also obtained another and different parasite belonging to the genus *Torymus*, with the hindmost thighs much thicker than the others and notched beneath at the end.

The ravages of the joint worms in the wheat-fields of Virginia subsequently attracted the attention of Prof. J. L. Cabell, who came to the conclusion that the joint worm is the larva of a hymenopterous, and not of a dipterous, insect. Dr. Harris completes his summary of the history of these insects with the following remarks: —"The foregoing account might be thought to afford conclusive evidence that the *Eurytoma* alone was the author of the mischief done to the wheat and barley, and that it is not a parasitical insect. In favour of this opinion we have the fact that hitherto no person has

succeeded in obtaining from the diseased wheat-straw so much as a single specimen of *Cecidomyia*, while both the wheat and the barley straw have yielded to several observers, in repeated instances, numerous specimens of the same kind of *Eurytoma* and nothing else, saving an extremely small number of lesser parasites. The determinations of this difficult and interesting question is of much importance in a scientific and an economical point of view. We are to consider, in destroying the *Eurytoma*, whether we shall kill an enemy or a friend. If it be a parasite, as the almost universal opinion of entomologists would lead us to believe, it would be the height of folly to attempt to interfere with its operation. On the other hand, if we can show it to be a plant-eating insect, we may use such means as are in our power towards checking its career, not only with perfect safety, but with eminent advantage."—'Treatise,' p. 445.

In the 'American Agriculturist,' New York, August, 1861, Dr. Fitch reasserts that this *Eurytoma* is the origin of the joint worm, and enumerates four species of the *Eurytomæ*:—

1. *E. hordei*, Harris, which has the shanks of all the legs black.

2. *E. fulvipes*, Fitch, Journ. New York State Agr. Soc. ix. 115, with the shanks and thighs tawny yellow.

3. *E. tritici*, Fitch, *l. c.*, with the shanks of the fore legs pale yellow and of the others black.

4. *E. secalis*, Fitch, n. s. The rye-fly, with the fore and hind shanks pale yellow, and the middle ones black. Very common in Connecticut.

These insects are described in detail, and their economy given, in Dr. Fitch's 'Seventh Report on the Noxious Insects of New York,' pp. 151—165.

In the 'Bulletin de la Société Imperiale des Naturalistes de Moscow,' 1880, part iii., Prof. K. Lindeman has published a memoir on the *Eurytoma hordei* and *Cecidomyia ceralis*, which had for five years previously proved very injurious in the Russian State of Mohilev to the rye crops; and in the 4th part of the same volume of the Moscow Bulletin, Prof. Lindeman has described several Chalcidideous parasites which he had reared from the diseased joints of the rye, as well as a distinct species of *Eurytoma* (*E. albinervis*), which also resides in the knotted joints of the rye.

Dr. Ratzeburg ('Ichneumonen Forstinsecten,' Bd. i.,

4to, 1844, p. 171) has given a revision of the genus *Eurytoma*, in which the divisions and subgenera proposed by Walker and Förster are rejected, and objecting to the supposed phytophagous character of some of the species, as proposed by Nees v. Esenbeck; all the species observed by him being asserted to be parasites, some of them being even supposed to be parasites on the parasites (*Schmarotzer—Schmarotzer*) of the gall-fly or other insects from which they have been observed to have originated. Moreover, he gives instances of the polyphagism and even pantophagism of some of the species, several of which are parasites on wood-boring Coleoptera of the genera *Hylesinus* and *Eccoptogaster*, as well as upon *Nemati*, *Saperdæ*, and *Magdalis*.

The species described by Dr. Ratzeburg are:—

1. *E. signata* 'Wahrscheinlich der Haupt-Eichen-Gallenschmarotzer unter den Eurytomen.'

2. *E. flavovaria*, n. s. Fourteen male specimens reared from *Hylesinus fraxini* from Upper Silesia.

3. *E. flavo-scapularis*, n. s. Also parasitic on *Hylesinus fraxini*.

4. *E. Abrotani*.

5. *E. verticillata*, Nees.

6. *E. eccoptogastri*, n. s. From a "kranken apfelzweigen" in which *Eccoptogaster rugulosus*, *Saperda præusta*, and a *Magdalis* were found.

7. *E. abieticola*, n. s. From "Fichtenknüppeln" inhabited by *Magdalis violacea*.

8. *E. ischioxanthus*. Obtained with *E. flavovaria* from *Hylesinus fraxini*.

In the second volume of the same work, 1848 (p. 177), Dr. Ratzeburg has added the descriptions of three additional species of *Eurytoma*:—

9. *E. aciculata*. Obtained both males and females from "Weidengallen" and from *Salix viminalis*, probably being parasitic on *Nematus angustus*.

10. *E. striolata*. From *Eccoptogaster intricatus*.

11. *E. costata*. Males obtained from cocoons of the *Microgaster* of *Pontia crataegi*.

And in the third volume of the same work, 1852, p. 220, four more species of *Eurytoma* are described:—

12. *E. extincta*. Parasitic on *Nematus angustus*. "Von Hrn. Brischke aus dem Stiele der Weidenrosen erzogen."

13. *E. pinetorum*. Parasitic on *Hylesinus minimus*.

14. *E. microneura.* From a *Cecidomyia* upon "Weidenrosen-zucht."

15. *E. brunniventris.* From an oak-gall.

With the addition of—

16. *E. plumata*, Ill. From the *Microgaster* of a *Liparis.*

The group of *Eurytomides*, and especially the real economy of *Eurytoma hordei*, engaged the attention of the late Benjamin D. Walsh, M.A., and formed the subject of two elaborate memoirs published in the 'American Entomologist,' vol. i., pp. 149—159 (1869), and vol. ii., pp. 297, 329, and 367 (1870).

The first of these memoirs is especially devoted to the joint worm (*Isosoma hordei*), the larva of which is described as but little more than one-eighth of an inch long, and of a pale yellow colour, with the exception of the jaws, which are dark brown. It inhabits a little cell, which is situated in the internal substance of the stem of the affected plant of wheat, barley, or rye, usually a short distance above the first or second knot from the root, the outer surface of the stem being elevated in a corresponding elongate blister-like swelling; and when, as is generally the case, from three to ten of these cells lie close together in the same spot, the whole forms a woody enlargment honeycombed by cells, and is in reality a many-celled or "polythalamous" gall. Occasionally, but rarely, galls are situated in the middle of the internode, or even close to the upper knot. The mischief done by these insects is in certain localities "seriously great." In 1851, throughout a large portion of Virginia, "many crops of wheat were hardly worth cutting on account of their attacks." In central New York Mr. G. Geddes, late President of the New York State Agricultural Society, writes :—"Formerly we expected forty bushels of barley to the acre; now we cannot rely on more than twenty."—('Trans. N. Y. Agr. Soc.,' 1859, p. 332).

The fact of the deposition of the eggs by the female *E. hordei* in the healthy stalks of the plants was distinctly observed and described by Mr. Pettit, of Grimsby, Canada West ('Canada Farmer,' 1867, p. 268). He states that he had "watched the growing barley, and on the 10th of June found the perfect insects actively at work ovipositing in *the then healthy stalks* of the plant." After leisurely creeping up and down the plant, "the

females, head downwards, begin by bending the abdomen downward, and placing the tip of the ovipositor on the straw at right angles with the body, when the abdomen resumes its natural position, and the ovipositor is gradually worked into the plant to its full extent. With the aid of a good lens, and by pulling up the plants on which they were at work (which did not appear to disconcert them in the least) I could view the whole operation."

Mr. Walsh adds that upon July 3rd he examined "a large lot of the green barley-galls received from Mr. Pettit, and found the larva of the joint fly almost half grown, that is, from 0·004 to 0·006 inch long, and about five times as long as wide. In these green galls, upon the most careful search, he could find no gall-gnat larvæ, nor any vestiges of such larvæ." If the so-called joint-worm fly were really a parasite, we must certainly have discovered, at the early period of the year, a few specimens of the larvæ upon which it was parasitic, or at all events some traces of their handiwork." Mr. Walsh therefore comes to the inevitable conclusion (already arrived at by Harris and Fitch, and contrary to the opinion which Walsh had expressed previously in the 'Practical Entomologist,' i., pp. 10—12 and 37, 38) "that the joint fly was the real author of these galls, and we think it right to bear this public testimony to the correctness of their entomological inferences" (p. 151).

Mr. Walsh then describes a truly parasitic Chalcideous insect (*Semiotellus chalcidiphagus*), one of the larvæ of which "emerged under our very eyes from the body of a joint worm"; whilst in other instances he had found the parasitic larvæ attached externally to its victim, in the manner common with the larvæ of many *Chalcis* flies. He then details his observations on many specimens of the *I. hordei*, which he had reared from Canada barley-galls, proving that Dr. Fitch's four species of joint-worm flies are mere varieties of one and the same species.

Adopting an opinion expressed by Professor Agassiz* ('Essay on Classification,' p. 59), Mr. Walsh insists on

* "The more I learn upon this subject," says Agassiz, "the more am I struck with the similarity in the very movements, the general habits, and even the intonation of the voices of animals belonging to the same family."

the law of Unity of Habits in insects and other animals, and which he briefly states as follows:—"In the case of all known animals, species belonging to the same genus have the same, or nearly the same, habits, and this is also partially true of genera belonging to the same family, but not unfrequently genera belonging to the same family have very widely distinct habits." "Consequently, as the genus and the habits of any particular species of animal are both of them determined by the structure, when the genus of two species is the same, the habits also must of necessity be the same, or very nearly the same."

In illustration of these principles Mr. Walsh cites the case of *Zabrus* (a genus belonging to the great carnivorous family of ground beetles, *Carabidæ*), which feeds upon living and growing vegetables; also the genus *Oödes* (belonging to the same family of ground beetles), which generally makes for the water when endeavouring to escape, crawling under floating rubbish, and the genera *Arma* and *Stiretrus* (belonging to the family of the plant bugs, Heteroptera), but which have very stout robust beaks suitable for piercing the bodies of other insects, and cannibal in their habits; whilst all the other *Scutelleridæ* have tender beaks only for piercing vegetation. Upon minutely examining the perfect joint-worm fly, and comparing it with the other *Eurytomides*, Mr. Walsh ascertained that the former neither belonged to the genera *Eurytoma* nor *Decatoma*, to which the greater portion of these *Eurytomides* are referrable, but to a distinct genus, *Isosoma*, Wlk.

To the genus *Isosoma* (with 9-jointed antennæ in both sexes, not counting the minute annuli nor any articulation in the terminal joint), Mr. Walsh refers the "notorious joint-worm fly, which I have clearly ascertained to be the veritable author of the galls upon the stems of wheat, barley, and rye, figures of which galls are given."—('American Entomologist,' vol. ii., p. 329). From Harris and Fitch, down to Glover and Packard, all authors have hitherto referred this insect to the genus *Eurytoma*, from which, however, it differs essentially. If it could with any propriety be referred to that genus we should then have a case of the same genus including both parasitic and plant-feeding species, and I *do not believe that any such violation of the great law of the* Unity of Habits *can be met with anywhere in Nature.* As

long ago as 1867 I published, in the 'Canada Farmer' for that year (pp. 267-8), a short article acknowledging my error (as given to the world in the 'Practical Entomologist' i., pp. 10—12 and 37, 38) in disputing the conclusions at which Harris and Fitch had many years before arrived, namely, that the joint-worm fly is the real author of the joint-worm galls. In this same article will also be found the following passage, in regard to the generic determination of this insect:—"The joint-worm fly differs generically from all the numerous species of the *Eurytoma* group which I have ascertained to be parasitic on other insects, and cannot, I think, be referred with any propriety to the genus *Eurytoma*, although it undoubtedly belongs to the *Eurytoma* group." "Certainly, if preceding authors had referred this species to its proper genus, I should not have been so unwilling to believe in its being a true vegetable feeder. As soon as I became acquainted with it the mystery was solved at once."—'American Entomologist,' p. 329.

Mr. Walsh then discusses the question of the specific identity of the specimens of *I. hordei* reared from wheat, rye, and barley, and insists that Fitch's four species, founded on the different food-plant and colour of the legs of the individuals, can only be considered as varieties of one species.

No other species of *Isosoma* is described by Mr. Walsh.

In the second of Mr. Walsh's memoirs the genera *Eurytoma*, *Decatoma*, and *Isosoma* were adopted. In *Eurytoma* (with 8-jointed male and 8-jointed female antennæ, not counting the minute annulus or annuli between the 2nd and 3rd joints, or any apparent articulation in the terminal joint or clava), eight species were described, including the *E. studiosa*, Say, the remainder being new species.

1. *E. bicolor*, W., p. 298. Reared from rough, woody, subglobular, black, fungoid swellings upon the twigs of black oak infested by an undescribed species of gall-fly.

2. *E. prunicola*, W., p. 298. Bred from oak-galls of *Cynips Quercus prunus*, Walsh.

Var. *E. globulicola*. Bred from the Cynipideous oak-gall, *Cynips Q. globulus*, Fitch.

3. *E. auriceps*, W., p. 299. Bred from the Cynipideous oak-gall of *Quercus erinaceus*, Walsh (= *Q. pisum*, Fitch?); also from galls of *Q. spongifica*, O. S., and *Q. hirta*, Bassett, with a single female from the Cynipideous rose-gall, *radicum*. O. S.

Var. *seminatrix*. Bred from the Cynipideous oak-gall, *seminator*, Harris.

4. *E. punctiventris*, W., p. 299. Bred from the Cynipideous oak-gall, *Q. mamma*, Walsh.

5. *E. abnormicornis*, W., p. 299. Captured at large.

6. *E. diastrophi*, W., p. 299. Bred from the Cynipideous bramble-gall of *Diastrophus nebulosus*, O. S., and from an oak fungoid-gall.

Var. *Bolteri*, Riley. Reared from the Lepidopterous golden-rod gall of *Gelechia gallæsolidaginis*, Riley.

7. *E. studiosa*, Say, W., p. 299. Bred from various Cynipideous oak-galls; from Tenthredinideous willow galls; from Cecidomyideous galls; from Aphidian leaf-galls; from Coccideous leaf-gall; and from a black fungoid swelling on the pig-nut hickory.

8. *E. gigantea*, W., p. 300. Captured at large.

In *Decatoma* the male antennæ are described as 7-jointed, and those of the female as 8-jointed (not counting the annuli nor any articulation in the terminal joint).

Five new species are described in this genus:—

1. D. *varians*, W., p. 300. Bred from the Cynipideous oak-galls, *Q. podagræ*, Walsh, and *Q. spongifica*, O. S.

Var. *dubia*. Bred from the Cynipideous oak-gall, *Q. mamma*, Walsh.

2. *D. nigriceps*, W., p. 300. Bred from the Cynipideous oak-gall, *Q. ficus*, Fitch.

Var. *excrucians*. From the white oak-gall, *seminator*, Harris.

3. *D. hyalinipennis*, W., p. 301. Captured at large.

4. *D. simplicistigma*, W., p. 301. Bred from the Cynipideous oak-galls, *Q. erinaceus*, Walsh, and *Q. petiolicola*, Bassett.

5. *D. nubilistigma*. Bred from the Cecidomyideous willow-gall, *S. batatas*, Walsh, and a swamp white oak-gall.

In the Proceedings of the Entomological Society of London for 4th July, 1870 ('Journ. Proc.,' p. xxx.), it is stated that Mr. Albert Müller exhibited some galls upon *Ammophila arundinacea*, found in the preceding autumn by Mr. J. Traill, about two miles north of Aberdeen; they occurred rather abundantly on stunted specimens, one gall on each plant; the gall consisted of the imbricate closely-sheathed leaves of a top shoot, and contained a single longitudinal narrow cell from two to three lines long, the

upper part of which was pierced by the escaping insect, which had not, however, been detected.

The same insect is recorded by Herr Ritsema, in the 'Proceedings' of the Entomological Society of the Netherlands ('Tijdschrift voor Entomologie,' 2nd serie, vol. vi., 1871, p. 148), to have been found in different parts of Holland, especially near Zandvoort, where it was first found by H. Ritzema's brother in 1867. It had also been observed by HH. Weyenbergh and Snellen van Vollenhoven, and had also been previously recorded in the 'Archives Neerlandaises des Sciences exactes,' vol. v., 1870. By these Dutch entomologists it had been ascertained that the galls in question were made by *Eurytoma longipennis*.*

Professor G. H. French, of Carbondale, Illinois, described in the 'Prairie Farmer' for Dec. 31st, 1881, and more fully in the 'Canadian Naturalist' for Jan., 1882, both sexes of a species which he believed to be a new wheat pest, under the title of *Isosoma Allynii*; the larvæ of which were found inside the stalks of growing wheat in Southern Illinois, before the ripening of the grain, and in the straw and stubble during the rest of the summer. They were found mostly in the interior of the 1st and 2nd internodes below the one supporting the head, usually singly, but sometimes more than one in the same internode. They produce no swelling or gall, as do the larvæ of *I. hordei*, but feed upon the soft tissue of the interior of the stalks. They are about 0·15 in. long, rather slender, tapering slightly towards either end, footless, but when in motion seeming to have the power of pushing out the substigmatal portion of the segments, a distinct transverse head about two-thirds of the width of the body, with a pair of brown jaws. Colour yellow, approaching to pale orange. The pupæ vary from about

* Mr. Walker has mentioned the discovery of the economy of this species in his 'Notes on Chalcidiæ,' in which he has given a series of notes on numerous British species of Eurytomides, together with the descriptions of two new genera *Philachyra*, Hal., of which the male is winged and the female apterous, of which the type *P. Ips* was found in straw roofs near Lucca, Italy. The other genus, *Aiolomorphus* (type *A. rhophaloides*), is from Hong Kong (no museum where it may be seen is mentioned). Mr. Walker also mentions (*op. cit.*, p. 7) that he was indebted to Mr. Saunders, of Ontario, Canada, for specimens of *Isosoma vitis*, which is mentioned in the 'Zoologist' as being cradled in grape-stones.

0·08 to 0·12 in. long, black, and of the usual hymenopterous form.

Another species of *Isosoma* was also described by Prof. French in the same memoir, under the name of *Isosoma clymi*, the larvæ of which were found on the interior of the culms of *Elymus canadensis* in about the middle internodes of the stalks, very much as the larvæ of the preceding species are to be found on the interior of wheat culms. While, however, the wheat larvæ are generally just above the joint, these may be found in any part of the interior of the internode. Both feed upon the soft tissue of the interior of the stalk, and do not produce any enlargement; the only noticeable effect from the outside is that internodes containing larvæ are usually shorter than the others. The larvæ are footless, about 0·10 in. long when still, and 0·04 in. wide in the widest part, with brown jaws. Colour very pale yellow, and, like the preceding, there appear to be slight projections from the sides of the body at times.

Specimens of the first of these two species having been submitted by Prof. French to Mr. Riley, and to myself through Miss Ormerod, prove to belong not to *Isosoma*, but are "a species of *Eupelmus*, parasitic, doubtless, on some of the wheat-stalk feeders, and probably on some species of *Chlorops*" ('Amer. Naturalist,' March, 1882, p. 247).

An additional species of *Isosoma* which affects wheat has just been described by Mr. Riley in the 'Rural New Yorker,' and again at greater detail in the 'American Naturalist' for March, 1882, under the name of *Isosoma tritici*, received from Tennessee and Missouri. Although congeneric with the joint worm (*I. hordei*), it differs widely from the latter in habits and appearance. The joint worm forms a gall-like swelling at a joint near the base of the stalk, whilst the species under consideration feeds on the interior of the stalk between the joints higher up, without causing a swelling. The larva figured by Mr. Riley is long and quite eruciform, with the segments of the body distinct and of nearly equal width throughout its whole length; the head is furnished with two very small filiform porrected antennæ, arising from a thickened basal joint; the mandibles are deflexed, nearly triangular, acute at the tip, with a small conical tooth near the apex of the inner margin. Mr. Riley adds that "it is worthy of remark that this new species seems to be quite closely related to the

European *Isosoma linearis* which was bred from wheat by Dr. Giraud,* who considered it inquilinous in the swellings formed by the dipterous *Octhiphila polystigma* of Meigen. Kaltenbach remarks, however, that although obtaining the *Isosoma* many times from the wheat, he never succeeded in seeing this dipteron—a very suggestive fact."

The attention of the members of the Scientific Committee of the Horticultural Society of London was directed by Mr. Bateman, on the 2nd March, 1869, to the injury committed by several insects on the bud of an exotic species of Orchid, beneath the overlapping leaves of which two white fleshy grub-like larvæ (evidently Curculionideous, and closely resembling those of the common nut weevil) were securely nestled, and which had been feeding upon the thickened substance of the leaves, the surface of which was eaten off to some distance without any hole being gnawed through the leaf. Immediately in the vicinity of these larvæ† were also found several minute dead pupæ lying in a mass of hard dry particles of dark-coloured matter (doubtless the excrement of the larvæ from which the pupæ had been developed). These pupæ were Hymenopterous, and by carefully scaling off the thin horny external pellicle under the microscope they were ascertained to belong to the family *Chalcididæ* and to the genus *Isosoma*, both sexes of which were thus brought to life. In this case it was evident, 1st, that the weevil larvæ were uninjured, so that the *Isosomæ* were not parasitic upon them; 2nd, that the *Isosomæ* larvæ had already gone through the whole process of their economy, whether phytophagous or entomophagous; and 3rd, as no trace could be perceived of a third species of insect, the probability seems evident that the *Isosomæ* were not parasitic on other insects. For the sake of identification I proposed the name of *Isosoma orchidearum* for this species ('Gardeners' Chronicle,' 27th Nov., 1869, p. 230).

The following is a description of the species:—

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* The important memoir of Dr. Giraud ('sur les Insectes qui vivent sur le Roseau commun') will be noticed in a supplementary article at the end of the present volume.

† It might be assumed, from the presence of the weevil larvæ and parasitic pupæ in the same burrow, that the latter were parasitic upon the former; but it will be perceived that the larvæ were still well and active, whilst the parasites had already completed the larva period of their lives and had become pupæ.

Isosoma orchidearum, Westw. (Pl. XIII., figs 1 & 4).

Nigrum, modice elongatum, capite et thorace rude punctatis, antennis maris longe pilosis, articulis intermediis crassioribus singulo apice strangulato, articulis 2ndo brevi, annulo inter hunc et sequentem articulum, 4 proximis sensim minoribus, 7mo subovali, 8mo fere præcedenti æquali, ultimo 9no parvo subconico; fœminæ articulis 7 pone annulum fere æqualibus subovalibus, 8vo præcedenti parum majori, 9no longiori, articulo 1mo hujus sexus basi fulvo, maris nigro; pedibus maris geniculis tarsisque tibiisque anticis fere toto fulvis, articulo ultimo tarsorum nigro: fœminæ tibiis intermediis etiam fulvis. Abdomine nitido glabro compresso, maris ovali apice rotundato pedunculo longiori; fœminæ pedunculo breviori, apice abdominis acuto. Alis pallide fumosis immaculatis iridescentibus. Long. corp. 4—5 mm.; expans. alar. 6—7½ mm.

Hab. In gemmis Cattleyiæ cujusdam Brasilianæ.

In April, 1881, I received from a correspondent (Inquirer) several buds of a species of *Cattleyia*, a Brazilian and Mexican genus of Orchids, which had been injured by the larvæ of a small Hymenopterous insect, of which a figure is given in the accompanying Plate xiii. Fig. 10 also represents one of the *Cattleyia* buds cut open at the base, showing three of the larvæ ('Gard. Chron.,' 30th April, 1881, p. 575).

From another correspondent (E. C.) I also received several *Cattleyia* buds which had holes bored in the interior, within which I found several specimens of the *Isosoma orchidearum* of both sexes in the winged state ('Gard. Chron.,' 22nd October, 1881, p. 542). This discovery led to my publishing a short note "On the Abnormal Economy in certain Species of the Eurytomides" in the 'Gard. Chron.,' 29th October, 1881, p. 567.

Plate xiii., fig. 1, represents the male of *I. orchidearum*, the separate outline fig. 3 representing the delicate ceratotheca or pupal sheath of the flagellum of the antenna, not exhibiting the slightest trace of the nodosity of those organs in the imago state.

Fig. 4 represents the female, with (fig. 6) the ceratotheca of its antenna.

Fig. 8 represents a portion of the shoot of the orchidaceous plant, communicated by Mr. Bateman, partially opened, showing one large larva of a weevil and four

pupæ of the *Isosoma*, with the pellets of excrement discharged by the larvæ before their transformation to that state; one of the pupæ seen laterally is represented in fig. 14, highly magnified.

Fig. 10 represents a *Cattleyia* bud cut open at the base, showing three of the larvæ of the *Isosoma*; whilst fig. 9 represents another *Cattleyia* bud cut open, showing six of the pupæ. The larva itself is represented in fig. 11. It is considerably more swollen than that of *I. tritici*, as figured by Mr. Riley, the sides of the body showing the swollen portions, which are capable of greater or less dilatation. The figure of this larva will be seen closely to resemble that of *Blastophaga Psenes*, figured in Plate iv., fig. 26.

Fig. 12 represents the head of the larvæ seen laterally and rather obliquely, with the two minute antennæ each arising from a dilated fleshy base; and fig. 13 represents the front view of the head, with the two bidentate mandibles and two swollen lateral parts, which probably represent the maxillæ.

Plate xiv., fig. 18, represents the larva of *Isosoma tritici*, copied from Prof. Riley's figure.

Mr. T. Whitmarsh, of Wilton, near Salisbury, has paid much attention to the *Cynipidæ*, having reared a large number of the species, and has been so good as to furnish me with a number of microscopical preparations of them. Amongst them are specimens of both sexes of a species of *Isosoma* which he reared from swellings on grass (some with and some without holes in them), gathered in 1873, from which the *Isosomæ* were produced in the latter part of June and beginning of July in the following year. The antennæ in the male specimens thus obtained are long, considerably pilose, with the 2nd joint short (scarcely longer than thick), followed by a minute annulus, and this by seven distinct joints, which gradually become rather more slender and shorter towards the end of the antennæ; the extremity of each of these joints is strangulated, and the terminal joint is quite entire, longer and more slender than the preceding joint, with the tip pointed. The female antennæ have the seven terminal joints also quite distinct and but very slightly thickened towards the tip of the antennæ, without any distinct subarticulation visible in the terminal joints. The clypeus in the female is produced in the centre, and slightly furcate.

Another species of *Isosoma*, the antennæ of which exactly agree with those of *I. orchidearum*, was reared by Mr. Whitmarsh from hard hollow pink pepper-corn galls on the under side of oak-leaves gathered in August, 1872, the flies immediately making their exit from the galls. The microscopical preparations made of this species by Mr. Whitmarsh exhibit several parts of its structure so clearly that I have thought it desirable to represent them, as the species which attacks the *Cattleyia* buds will doubtless possess a perfectly similar organisation.

The mandibles (Pl. xiv., fig. 15*a*) are very robust, subtriangular, pointed at the tip with one acute and one broad truncated tooth on the inner edge. The lower parts of the mouth are well defined. The maxillæ (fig. 15) have a broad basal portion working upon a narrow muscular attachment; whilst the apical portion is formed of two blades, slightly curved, obtuse at the tips, setose on the outer margin; and the maxillary palpi are distinctly 4-jointed, the three basal joints small, nearly equal in size (the 2nd being rather larger than the others); and the 4th is as long as the rest united, and slightly dilated and obliquely truncated at the tip.* The mentum is semiovate, the anterior portion being narrowed on either side; it is affixed upon a narrow, elongated triangular stipes; the labium is as long as the mentum, rounded at its extremity, and the labial palpi are distinctly 3-jointed, the basal joint being the thickest, the 2nd joint the shortest, and the 3rd slender, obtuse, and setose at the tip. The body of the male is terminated by a retractile flattened elongated penis, pointed at its extremity (fig. 17), and is furnished with a pair of short flattened claspers, each having three short acute teeth on its outer apical portion, similar in position and shape to the organs in the males of *Sycophaga crassipes* (see Plate iii., figs. 15 to 18). The organs of oviposition in the female are represented in fig. 16, in which the sheath

* Mr. Curtis, 'Brit. Entom.,' pl. 345 (February, 1831), represents the structural details of *Decatoma biguttata*, Swederus, figuring the maxillary palpi as 3-jointed and the labial palpi as 2-jointed. He states, however, that Mr. Haliday had observed that the maxillary palpi of *E. longula*, Dalman? are 4-jointed, whilst the labial are 2-jointed. In a specimen of, I believe, *E.* (*Decatoma*) *biguttata*, reared from soft cherry-like galls on the under side of oak-leaves by Mr. Whitmarsh and prepared in Canada balsam, the maxillary palpi are distinctly 4-jointed.

is withdrawn from its flattened horny scabbard; it is very slender, armed at its apex with several very fine teeth; and in the preparation here figured one of the delicate spiculæ is seen entering the sheath at its base, whilst another of the spiculæ is more withdrawn, entering the sheath at a little distance beyond its base.

As a further illustration of the relationship between some of the fig insects and other well known parasitic *Chalcididæ*, I have added a figure (Plate xiv., fig. 21) of the generative organs of the males of one of the most curious Pteromalideous species, *Platymesopus apicalis*, Westw.,* which has been reared by Mr. T. Whitmarsh from the small woody bud-like oak-galls on the preceding year's shoots, a little below the current year's shoots. The species is remarkable for the dilated middle tibiæ terminated by a small patch of short black hairs, and by the delicate pale yellow antennæ terminated by an oval black clava. In my fig. 21 it will be observed that the elongated exserted penis is furnished with a pair of flattened claspers, each having five or six short curved spines on its outer apical margin, which are preceded by a pair of slender short filiform 2-jointed lateral appendages, each having a terminal bristle directed outwards.

I terminate this memoir with the description and figures of both sexes of the largest and finest species of the Eurytomides with which I am acquainted, which has been communicated to me by G. H. K. Thwaites, now of Kandy, Ceylon. It was found by him "feeding or inhabiting some fleshy galls upon the leaves of *Ficus Tjïela*, together with their Ichneumonideous parasites." From what has been already advanced in this memoir, I have but little doubt that this beautiful species is the real maker of the gall, from which specimens of both sexes have been reared.

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* *Platymesopus apicalis*, n. s.—Capite et thorace læte viridibus, abdomine nigricanti, fascia lutea transversa prope basin, antennis pedibusque stramineo-flavis, illis thoracis longitudine gracilibus, articulis 6 inter annulos et clavam triarticulatam apicalem nigram; tibiis intermediis intus dilatatione tenui semiovale apice externo fasciculo brevi setarum nigrarum instructo. Long. corp. 2 mm. Expans. alar. 2½ mm.

Habitat in galla parva lignea gemmarum Quercus, mense Junio exeunti.

Obs. Magnitudine et coloribus *Mesopolobo fasciiventri*, Westw. simillimus.

Eurytoma taprobanica, Westw. (Pl. XIV., figs. 23 & 25).

Species magna et insignis. Mas, rufo-luteus, capitis vertice, dorso pro- et meso-noti, scutello, metanoto tenui, pedunculo abdomine et segmentis apicalibus abdominis nigris; antennis crassioribus, 9-articulatis, articulo 2ndo parvo, 3tio longo, reliquis 6- magnitudine decrescentibus, omnibus (1mo excepto) setis numerosis obtectis, pedibus fulvo-rufis femoribus intermediis in fossula inter coxas et basin alarum receptis. Fœmina, capite et thorace ferrugineis valde punctatis, metanoto brevi nigro, abdomine late-ovali nigro glaberrimo, antennis nigris articulis duobus basalibus rufescentibus 8-articulatis articulo ultimo, ut videtur 3-articulato; pedibus nigris geniculis tarsisque rufescentibus, alis in utroque sexu fere hyalinis iridescentibus vix infumatis nubila fusca substigmaticali. Long. corp. 6 mm. Expans. alar. 10 mm.

Hab. In insula Taprobana in gallis Ficus Tjielæ (D. Thwaites) mecum amicissime communicata. In Mus. Oxoniæ.

From the same galls of *Ficus Tjiela* were also reared by Mr. Thwaites a number of Ichneumonideous parasites, of which only females were sent to me. The following is their description:—

Bracon sculptilis, Westw. (Pl. XIV., fig. 27).

Capite luteo, vertice nigro, antennis gracillimis nigris; thorace brevi ovato, fulvo, metanoto nigro glabro; abdomine obscure-luteo, segmentorum dorso nigro punctatissimo, singulo segmento serie transversa basali punctorum majorum oblongorum, segmentis terminalibus, fere omnino lutescentibus; pedibus pallide luteis, femoribus et tibiis 2 posticis nigris geniculis luteis; alis fere hyalinis, vix infumatis, iridescentibus, cellulis 1ma et 2nda submarginalibus fere æqualibus, oviductu corporis longitudine sub pectus incurvo. Long. corp. $5\frac{1}{2}$ mm. Expans. alar. 14 mm.

Hab. In insula Taprobana. In gallis *Ficus Tjiela* parasitica (D. Thwaites) mecum communicata. In Mus. Oxoniæ.

Explanation of Plates.

PLATE XIII.

Fig. 1. *Isosoma orchidearum*, male, magnified.
2. Antenna; and 3, ceratotheca of flagellum of ditto.
4. *Isosoma orchidearum*, female, magnified.
5. Antenna; and 6, ceratotheca of flagellum of ditto.
7. Fore leg of ditto.
8. Portion of stem of an Orchideous plant, with weevil larva and parasitic pupæ *in situ*.
9. Bud of Brazilian *Cattleyia*, with pupæ of *Isosoma orchidearum*.
10. Buds of *Cattleyia*, with larvæ of *Isosoma orchidearum*.
11. Larva of ditto, magnified.
12. Head of larva, seen sideways, rather obliquely.
13. Front of ditto, with bidentate mandibles.
14. Pupa of *Isosoma orchidearum*.

PLATE XIV.

15. Maxilla and labium of male *Isosoma* sp.; reared from peppercorn-galls on under side of oak-leaves; and 15*a*, mandible of ditto.
16. Ovipositor of female of ditto.
17. Penis of male of ditto, with its two claspers.
18. Larva of *Isosoma hordei*, after Fitch.
19. Antenna of larva of ditto.
20. Mandibles of ditto.
21. Penis of *Platymesopus apicalis*, male, and its appendages.
22. Middle tibia and tarsus of ditto.
23. *Eurytoma taprobanica*, male.
24. Antenna of ditto.
25. *Eurytoma taprobanica*, female.
26. Antenna of ditto.
27. *Bracon sculptilis*.

XIII. *A Revised List of British* Trichoptera, *brought down to date; compiled with especial regard to the 'Catalogue of British* Neuroptera,' *published by the Society in* 1870. By Robert M'Lachlan, F.R.S., F.L.S., &c.

[Read June 7th, 1882.]

My reasons for bringing forward this List are twofold in their nature. Firstly, considerable additions have been made to our fauna during the twelve years that have elapsed since the publication of the Society's Catalogue. Secondly, it had scarcely occurred to me in 1870 to contemplate the publication of the work which subsequently (1874—1880) appeared under the title 'A Monographic Revision and Synopsis of the Trichoptera of the European Fauna.' In working up the materials it became evident that the sequential position of various genera and species would have to be considerably modified, and also, in a few instances, that the nomenclature used in the Catalogue would require modification. The present List is therefore based upon the 'Revision and Synopsis,' the species known to occur in Britain being extracted therefrom (with one or two subsequent additions), *but the synonymy given refers solely to the nomenclature used in the Catalogue;* those who seek a full bibliographical history of each species must refer to the 'Revision and Synopsis.'

Every species not included in the Catalogue of 1870 (or not then recognised as distinct) is here indicated by an asterisk (*).

INÆQUIPALPIA.

PHRYGANEIDÆ.

Neuronia, *Leach.*
- ruficrus, *Scop.*
- clathrata, *Kol.*

Phryganea, *L.*
- grandis, *L.*
- striata, *L.*
- varia, *F.*
- obsoleta (*Hag.*), *M'Lach.*
- minor, *Curt.*

Agrypnia, *Curt.*
- picta, *Kol.*
- Pagetana, *Curt.*

LIMNOPHILIDÆ.

COLPOTAULIUS, *Kol.*
incisus, *Curt.*
GRAMMOTAULIUS, *Kol.*
nitidus, *Müller.*
atomarius, *F.*
GLYPHOTÆLIUS, *Steph.*
pellucidus, *Retz.*
LIMNOPHILUS, *Leach.*
rhombicus, *L.*
borealis, *Zett.*
pavidus (Hag.), M'L.
*subcentralis, *Brauer.*
flavicornis, *F.*
decipiens, *Kol.*
marmoratus, *Curt.*
stigma, *Curt.*
xanthodes, *M'Lach.*
borealis, Kol., *nec* Zett.
lunatus, *Curt.*
elegans, *Curt.*
politus, *M'Lach.*
ignavus (*Hag.*), *M'Lach.*
nigriceps, *Zett.*
striola, Kol.
centralis, *Curt.*
vittatus, *F.*
affinis, *Curt.*
auricula, *Curt.*
griseus, *L.*
bipunctatus, *Curt.*
extricatus, *M'Lach.*
hirsutus, *Pict.*
luridus, *Curt.*
sparsus, *Curt.*
fuscicornis, *Ramb.*
fumigatus, Germar(?)
ANABOLIA, *Steph.*
nervosa (*Leach*), *Curt.*
PHACOPTERYX, *Kol.*
brevipennis, *Curt.*
ASYNARCHUS, *M'Lach.*
Anabolia, partim.
cœnosus, *Curt.*
STENOPHYLAX, *Kol.*
alpestris, *Kol.*
dubius, *Steph.*
infumatus, *M'Lach.*
*rotundipennis, *Brauer.*
stellatus, *Curt.*
latipennis, *Curt.*
radiatus, Ramb.
concentricus, *Zett.*
hieroglyphicus, Steph.,
vibex, *Curt.* [*nec* Curt.
MICROPTERNA, *Stein.*
Stenophylax, partim.
sequax, *M'Lach.*
striata (Pict.), M'Lach.,
lateralis, *Steph.* [*nec* L.
HALESUS, *Steph.*
*radiatus, *Curt.* [partim.
digitatus (Schr.), M'L.,
digitatus, *Schrank.*
auricollis, *Pict.*
guttatipennis, *M'Lach.*
DRUSUS, *Steph.*
annulatus, *Steph.*
ECCLISOPTERYX, *Kol.*
guttulata, *Pict.*
CHÆTOPTERYX, *Steph.*
villosa, *F.*
tuberculosa, Pict.
ENOICYLA, *Ramb.*
pusilla, *Burm.*
APATANIA, *Kol.*
Wallengreni, *M'Lach.*
vestita, Kol., *nec* Zett.
muliebris, *M'Lach.*

SERICOSTOMATIDÆ.

SERICOSTOMA, *Latr.*
personatum, *Spence.*
Spencii, Kirby.
multiguttatum (Pict.), ♀
NOTIDOBIA, *Steph.*
ciliaris, *L.*
GOËRA (*Hoffm.*), *Leach.*
pilosa, *F.*
flavipes, Curt.
SILO, *Curt.*
pallipes, F.
nigricornis, *Pict.*
fumipennis, M'Lach.
BRACHYCENTRUS, *Curt.*
subnubilus, *Curt.*
CRUNŒCIA, *M'Lach.*
Mormonia, partim.
irrorata, *Curt.*
LEPIDOSTOMA, *Ramb.*
Mormonia, Curt.
hirtum, *F.*
LASIOCEPHALA. *Costa.*
basalis, *Kol.*

ÆQUIPALPIA.

LEPTOCERIDÆ.

BERÆA, *Steph.*
pullata, *Curt.*
maurus, *Curt.*
BERÆODES, *Eaton.*
Berœa, partim.
minuta, *L.*
MOLANNA, *Curt.*
angustata, *Curt.*
*palpata, *M'Lach.*
ODONTOCERUM, *Leach.*
albicorne, *Scop.*
LEPTOCERUS, *Leach.*
nigro-nervosus, *Retz.*
nervosus, F.
fulvus, *Ramb.*
grossus, Steph.
senilis, *Burm.* [Ramb.
fulvus, M'Lach., *nec*
albo-guttatus, *Hag.*
bimaculatus, Steph. *nec*
annulicornis, *Steph.* [L.
aterrimus, *Steph.*
cinereus, *Curt.*
albifrons, *L.* [*M'Lach.*
*commutatus (*Rostock*),
bilineatus, *L.*
bifasciatus, Oliv.
dissimilis, *Steph.*
MYSTACIDES, *Latr.*
nigra, *L.*
atra, Pict.
azurea, L.
nigra, Pict., *nec* L.
longicornis, *L.*
quadrifasciata, F.
TRIÆNODES, *M'Lach.*
bicolor, *Curt.*
conspersa, *Ramb.*
EROTESIS, *M'Lach.*
*baltica, *M'Lach.*
ADICELLA, *M'Lach.*
Setodes, partim.
reducta, *M'Lach.*
ŒCETIS, *M'Lach.*
Setodes, partim.
ochracea, *Curt.*
furva, *Ramb.*
intaminata, M'Lach.
lacustris, *Pict.*
*notata, *Ramb.*
testacea, *Curt.*
SETODES, *Ramb.*
tineiformis, *Curt.*
interrupta, *F.*
*argentipunctella, *M'L.*

HYDROPSYCHIDÆ.

HYDROPSYCHE, *Pict.*
pellucidula, *Curt.*
fulvipes, *Curt.*
instabilis, *Curt.*
angustipennis, *Curt.*
*ornatula, *M'Lach.*
guttata, *Pict.*
contubernalis, M'Lach.
exocellata, *Dufour.*
ophthalmica, Ramb.
lepida, *Pict.*
ventralis, Curt.
DIPLECTRONA, *Westw.*
felix, *M'Lach.* [*nec* Pict.
flavomaculata, Steph.,
PHILOPOTAMUS, *Leach.*
montanus, *Donov.* [Stph.
scopulorum (Leach),
scoticus, M'Lach. (*var.*)
WORMALDIA, *M'Lach.*
occipitalis, *Pict.*
*mediana, *M'Lach.*
subnigra, *M'Lach.*
NEURECLIPSIS, *M'Lach.*
bimaculata, *L.*
PLECTROCNEMIA, *Steph.*
conspersa, *Curt.*
*geniculata, *M'Lach.*
POLYCENTROPUS, *Curt.*
flavo-maculatus, *Pict.*
multiguttatus, *Curt.*
*Kingi, *M'Lach.*
HOLOCENTROPUS, *M'Lach.*
Polycentropus, partim.
dubius, *Ramb.*
Parfitti, M'Lach. ♀
picicornis, *Steph.*
CYRNUS, *Steph.*
trimaculatus, *Curt.*
flavidus, *M'Lach.*
ECNOMUS, *M'Lach.*
tenellus, *Ramb.*
TINODES, *Leach.*
Wæneri, *L.*
lurida, Curt.
aureola, *Zett.*
pusilla, Curt., *nec* F.
assimilis, *M'Lach.*
*unicolor, *Pict.*
dives, *Pict.*
Schmidtii, Kol.
LYPE, *M'Lach.*
Psychomyia, partim.
phæopa, *Steph.*
PSYCHOMYIA, *Latr.*
pusilla, *F.*
gracilipes, Curt.

RHYACOPHILIDÆ.

CHIMARRHA, *Leach.*
marginata, *L.*
RHYACOPHILA, *Pict.*
dorsalis, *Curt.*
septentrionis, *M'Lach.*
obliterata, *M'Lach.*
munda, *M'Lach.*
GLOSSOSOMA, *Curt.*
Boltoni, *Curt.*
vernale, *Pict.*
fimbriatum, Steph.
AGAPETUS, *Curt.*
fuscipes, *Curt.*
comatus, *Pict.*

HYDROPTILIDÆ.

AGRAYLEA, *Curt.*
multipunctata, *Curt.*
ALLOTRICHIA, *M'Lach.*
*pallicornis, *Eaton.*
HYDROPTILA, *Dalm.*
sparsa, *Curt.*
tineoides, Dalm.?
*occulta, *Eaton.*
*femoralis, *Eaton.*
tineoides, Dalm.?
*sp. nov.
*pulchricornis (*Pict.?*),
*forcipata, *Eaton.* [*Eatn.*
ITHYTRICHIA, *Eaton.*
*lamellaris, *Eaton.*
ORTHOTRICHIA, *Eaton.*
Hydroptila, partim.
angustella, *M'Lach.*
OXYETHIRA, *Eaton.*
Hydroptila, partim.
costalis, *Curt.*

SUMMARY.

The Catalogue of 1870 included 136 species. I now enumerate 152. Twenty of these are indicated by an asterisk, therefore are additions to the fauna. The discrepancy of four species is due to the fact that *Sericostoma multiguttatum* has been sunk as a variety of the female of (apparently) our only species of the genus; *Philopotamus scoticus* has been sunk as a variety of *P. montanus* (olim *scopulorum*); *Philopotamus montanus* of the Catalogue (= *ludificatus*, M'Lach.) has been erased as based upon insufficient evidence of British origin; and *Polycentropus Parfitti* proves to be the female of *Holocentropus dubius* of this List.

Of the twenty additions one, viz., *Hydropsyche ornatula*, is perhaps a little doubtful, being based as British upon one female example only, the identity of which requires confirmation.

One species of *Hydroptila* bears no specific name. This will be published in a new Supplement to the 'Revision and Synopsis,' which is in an advanced state. I do not consider that a list or catalogue is the place in which to indicate new species by names without descriptions.

It is not likely that the new Supplement, announced as in preparation, will occasion any serious discrepancy in the list, either in sequence or nomenclature. It may, however, be remarked that Wallengren has recently ('Entomologisk Tidskrift,' vol. i., 1880) effected a somewhat minute *generic* subdivision of the family *Phryganeidæ*,

and that I have not yet decided whether this will be adopted by me in its fullest extent, or be only indicated.

Considering the comparatively small number of species in Britain, an addition of twenty in about twelve years is eminently satisfactory.

Carrying this analysis further back to the date of publication of my "Trichoptera Britannica" (Trans. Ent. Soc. Lond., 3rd series, vol. v., 1865), I find 127 species there enumerated, but these would be reduced to 122 according to present views; therefore 30 species (equal to 20 per cent.) have been added since 1865.

XIV. *Descriptions of new species and a new genus of* Cicadidæ *from Madagascar.* By W. L. Distant.

[Read June 7th, 1882.]

Plate XV.

The more we see of the Rhynchotal fauna of Madagascar the greater is the amount of structural specialisation apparent, and its distinct character revealed. This is particularly the case with the Cicadidæ, and every species of the widely distributed Genus *Platypleura* which has yet been received from Madagascar has proved new to Science. I have added the description of another species here, and also of a new genus possessing an inflated abdomen, a character found in genera distributed in South Africa, Australia, and Polynesia.

Platypleura pulverea, n. s. (Pl. XV., figs. 1, 1*a*, 1*b*).

Body above ochraceous. Head with a black spot in centre of front, and with a marginal black line; its vertex with the following black markings :—a transverse band near each anterior angle, a waved transverse fascia between the eyes, widened at ocelli and surrounding the same in the shape of a subquadrate spot, on each side of posterior margin of which is a linear streak followed by a rounded spot and with an irregularly shaped spot on the inner margin of the eyes. Pronotum with the following black markings :—an acutely angled fascia on each side of disk, the inner line of which has a transverse base, a small arcuate spot beneath this, two oblique lateral fasciæ, and two rounded contiguous spots on centre of inner border of posterior margin. Mesonotum with the following black markings :—two short obconical spots on anterior margin, the apices of which are dentate, beneath these a central triangular spot followed by two round spots, and on each side an oblique submarginal fascia. A black spot on anterior branches of cruciform basal elevation. Abdomen with the basal margins of the abdominal segments black. Body beneath

ochraceous; apex of face, a central line and apex to rostrum, bases and apices of anterior and intermediate femora, apices of tibiæ, two spots on anterior trochanters, posterior margins of intermediate coxæ, a linear streak on intermediate and posterior trochanters, base of abdominal segments, and a central longitudinal streak on apical segment, fuscous. Opercula fuscous thickly covered with grey pubescence, and with their posterior margins narrowly ochraceous.

Tegmina hyaline; costal membrane and area, and venation ochraceous; transverse veins at apices of ulnar areas infuscated; a spot on costa near base, and a smaller one beneath it, two spots in radial area, two or three spots in each of the four upper ulnar areas, fuscous; apices of apical veins infuscated and thickened at each end. Wings pale hyaline, the veins pale ochraceous.

The face is broad, slightly convex, with a very broad longitudinal sulcation and strong transverse striations, the upper striæ black, their interstices broad. Rostrum long, passing the posterior coxæ. The pronotal margins are considerably ampliated, and obtusely angulated about the middle. The opercula are short and broad, their inner margins overlapping, their lateral margins obliquely rounded, their posterior margins convexly rounded and about reaching base of first abdominal segment. Long. ♂ 31 mm. Exp. tegm. 94 mm. Long. ♀ (one spec.), 37 mm. Exp. tegm. 105 mm.

Hab. Madagascar (E. L. Arnold).

Malagasia, n. g.

Head including eyes much narrower than base of pronotum, ocelli situate on disk of vertex and distant from base of head. Antennæ moderately long and slender, the first joint strongly incrassated. Pronotum compressed and narrowed towards head, the lateral margins obtusely dentate, the posterior angles amplified, flattened and rounded. Rostrum about reaching posterior coxæ. Tegmina hyaline, the space between the postcostal vein and the postcostal ulnar ramus amplified towards apex; apical areas eight, first or upper longer than second, ulnar veins separate and parallel at bases; the basal area considerably longer than broad. Wings hyaline, with six apical areas. Abdomen globose,

strongly convex above and somewhat flattened beneath; apical segment attenuated; tympana totally detached from first abdominal segment; opercula small, not covering the tympanal orifices. Anterior femora armed with strong spines beneath.

This genus I have placed next to *Prasia*, Stål, to which it has many affinities, but from which the amplified apical space between the post-costal vein and the post-costal ulnar ramus will alone distinguish it.

Malagasia inflata, n. s. (Pl. XV., figs. 2, 2*a*—*d*).

♀. Head and pronotum ochraceous or greenish. Head with a black submarginal border to front and with two transverse black fasciæ on vertex, the first at anterior margin of eyes, the second at base and extending along posterior margins of eyes. Pronotum with a waved, denticulated and rounded, black fascia on each side of disk, and with a broad submarginal black streak. Mesonotum with the following black markings:—two large obconical spots commencing at anterior margin, with their apices continued in a curved line and terminating in a rounded spot in front of each anterior branch of the basal cruciform elevation; on each side of these markings is a long irregular fascia, commencing at base and terminating in a somewhat rounded angulation near the anterior angles of basal elevation, and a somewhat rounded spot on each lateral margin. Abdomen dark ochraceous, with a faint black longitudinal central line. Head beneath, legs, sternum, and opercula, ochraceous or greenish; anterior femora black beneath; abdomen beneath ochraceous. Tegmina and wings pale hyaline, with the venation ochraceous; transverse vein at apex of lower ulnar area of tegmina fuscous.

The face is broad, but moderately convex, with a narrow but deep central and longitudinal sulcation, and with very strong transverse striations, the interstices of which are very broad. The anterior femora are strongly incrassated, and armed beneath with three black spines near apex, two of which are longest; all the tarsal claws are fuscous. The opercula are small and sub-triangular, the lateral margins straight and very oblique, the apex obtusely rounded and about reaching base of first abdominal segment. The posterior portion of the mesonotum and the upper surface of the abdomen is

very faintly and sparsely pilose or pubescent. Long. 40 to 42 mm., Exp. tegm. 98 to 108 mm.

Hab. Madagascar.

I possess a female specimen from Antananarivo, which appears to denote another species of this genus. Without, however, there are very strong structural differential characters, or the markings of the tegmina are very distinct, our knowledge of the *Cicadidæ* is little assisted by the description of solitary female specimens as new species, and I have therefore refrained from that course.

Explanation of Plate XV.

Fig. 1. *Platypleura pulverea.*
1*a*. Under side of head, showing face.
1*b*. Under side of abdomen, showing opercula and rostrum.
2. *Malagasia inflata.*
2*a*. Under side of head, showing face.
2*b*. Under side of abdomen, showing opercula and rostrum.
2*c*. Side view of abdomen, showing inflation and anal appendage.
2*d*. Apex of anal appendage, as seen above.

XV. Heterocerous Lepidoptera *collected in Chili by* Thomas Edmonds, Esq. By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Read June 7th, 1882.]

Part III.—GEOMETRITES.

Plate XVI.

There is great difficulty in deciding how many species of Geometrites exist in this collection, as it is impossible, without the most careful breeding, to be certain to what extent many of the species are liable to variation; were I to accept, on the one hand, the views of the collector, the amount of variation represented by some species would be so extraordinary as even to invalidate generic characters; form of wing, pattern, and coloration would in short entirely fail to define a species. On the other hand, were I to follow the plan adopted by M. Guenée in his "*Phalénites*," of considering as specific nearly every difference of coloration, I should undoubtedly go too far; this error, however, would in my opinion be preferable to the former. I therefore propose to follow a middle course, and regard as distinct all forms exhibiting differences in such characters as have hitherto been considered generic; and all in which the position of markings or the entire style of coloration is dissimilar.

The series before me is a remarkably fine one, and is an evidence of the indefatigable energy and zeal with which Mr. Edmonds has worked: so fine a series must of necessity include the greater part, if not all, of the species known to M. Blanchard, when preparing his descriptions for Gay's 'Fauna Chilena'; unhappily, however, these descriptions are so vague, I might almost say careless, and the illustrations in the Atlas are so exceedingly inaccurate, that it is impossible in many instances to decide whether or not one possesses the species intended.

That it may be seen that I do not speak without reason, I shall just give one instance of an utter discrepancy between the Latin diagnosis and the Spanish description of the same insect; M. Blanchard, describing the secondaries of his *Larentia triangularia* (which by the way is probably not a *Larentia* at all), says first of all, after mentioning that there are two little sinuated lines across the primaries, "*posticis, linea simillima*"; but in his description he says, "las alas posteriores redondeadas igualmente con dos líneas transversales."

Such inaccuracies as the above, although they may not in all cases prevent the student from recognising his species, must at least give him a considerable feeling of insecurity as regards the correctness of his identifications, and particularly when the species apparently best suited to a description belongs to a family widely distinct from that in which the author before him has placed his insect; if, therefore, I have erred either in my identifications or non-recognitions of M. Blanchard's species, I can only say that the fault lies with that author and not with myself.

Very few species have been described since the publication of Gay's work, even Walker not having touched them, at any rate so far as the present collection is concerned: the greater number of additions has been made by Felder and Rogenhofer in the 'Reise der Fregatte Novara.'

The following is a list of the species:—*

URAPTERIDÆ.

Gonogala, n. g.

Allied to *Urapteryx*, but the wings of the same form as *Tetracis*; the antennæ and coloration corresponding with *Metrocampa margaritata*: wings rather narrow, with angulated outer margins; body extremely slender, hardly extending beyond the secondaries; antennæ finely pectinated on both sides; palpi very small, scarcely extending at all in front of the head; anterior tibiæ with lateral internal appressed pencil of long hairs; both legs and proboscis long and slender.

* Mr. Edmonds informs me that the locality "Las Zonas" should be written "Las Zorras"; in English, "The foxes." It is a small suburb of Valparaiso.

1. *Gonogala lactea*, n. s.

Shining milky-white, the head, collar, and borders of the wings slightly tinted with sulphur-yellow; the abdomen pale gamboge-yellow, excepting at the extremities; wings mottled with pale greyish; primaries with two widely-separated white-bordered divergent grey stripes, between which is a short disco-cellular dash of the same colour; secondaries with oblique stripe beyond the middle; wings below with the grey stripes less distinct, the outer one of primaries commencing upon the costal border in a reddish brown spot; wings with minute ferruginous dots at the extremities of the nervures. Expanse of wings, 37 mm.

Exact locality not indicated.

The No. ("63") is omitted from Mr. Edmonds' notes.

Many of the genera hitherto placed in the *Urapteridæ* seem to me to belong to the *Ennomidæ*. Guenée's genus *Chærodes* (type *C. tetragonata*) includes species referable in my opinion to both families; the species with angulated primaries should be transferred to *Eutrapela* and *Sabulodes*. M. Guenée calls *Chærodes* "Genre très-naturel," yet places in it species with triangular primaries and subcaudate secondaries, along with others in which all the wings are angulated; the name *Chærodes* is preoccupied in Coleoptera.

ENNOMIDÆ.

Oxydia, *Guenée.*

2. *Oxydia rhoda*, n. s.

♂. Rosy brown; wings with a lilacine gloss; crossed from the costal margin, close to apex of primaries, to the middle of the abdominal margin of secondaries by an oblique mahogany-brown stripe, elbowed and attenuated at its upper extremity; primaries with mahogany-brown fringe, and bright rust-red costal border; secondaries with ferruginous fringe; basal area above the oblique stripe paler than the rest of the wing, not glossed with lilac; head and middle of collar dull lilac; antennæ pale reddish clay-coloured; thorax whitish, tegulæ lilacine; abdomen rosy; under surface paler; the primaries more ferruginous in tint from the base to the oblique stripe, which is abbreviated and ferruginous; a black disco-

cellular dot; secondaries lilacine-greyish, very pale, the stripe extremely indistinct; a small black disco-cellular spot; pectus greyish white; legs whity-brown; venter dull lilacine-grey. Expanse of wings, 45 mm.

"Coral, Valdivia, in February."—*T. E.*

Only one example of this beautiful and very distinct species is in the collection.

Acrosemia, *Herr.-Sch.*

3. *Acrosemia flavaria.*

♂ *Ennada flavaria*, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 87, n. 1; pl. 7, fig. 3 (1852-4).

"Las Zorras, December and January."—*T. E.*

M. Blanchard figures an unusually pale male, most examples being decidedly less yellow; the female, however, is bright orange, flecked with ash-grey, with the central belt of the primaries and basal two-fifths of the secondaries bright gamboge-yellow.

With this species the following was placed; but if it be a variety of *A. flavaria* it is a well-marked one, and certainly worthy of a distinct appellation.

4. *Acrosemia quietaria.*

♂ *Acrotomia quietaria*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxiii., fig. 19 (1875).

"Las Zorras, December and January."—*T. E.*

The female, as might have been anticipated, is brighter and more deeply coloured than that sex of *A. flavaria*, but in other respects corresponds with its male.

♂ var. With ground colour of the wings pale greyish stone, with the post-median oblique stripe sharply defined as in *A. flavaria*, greyish brown internally and cream-colour externally; the inner line ill-defined, scarcely perceptible.

A. quietaria seems to be about as common as *A. flavaria.*

Apicia, *Guenée.*

5. *Apicia valdiviana*, n, s.

Pale pearl-grey, shading into cream-colour, almost white; the wings crossed from near their apices to just

beyond the middle of their inner margins by an externally diffused pale violet stripe, dotted upon the veins with red-brown; apical fourth of the secondaries also slightly tinted with pearly violaceous; primaries with a black dot at the end of the cell, and a second at the basal third of the submedian vein; costal margin and antennæ rusty orange; body slightly cream-coloured; under surface sienna-red; wings crossed by a greyish violet stripe, and flecked towards the external border with the same colour; primaries with a bright yellow costal streak; base of costal margin red; internal border creamy white; secondaries with the abdominal area up to the median vein gamboge-yellow, but divided by the violet-grey stripe and with sienna-red external border; venter and legs flesh-tinted. Expanse of wings, 38 mm.

"Valdivia, from Reed's collection."—*T. E.*

Syncirsodes, n. g.

Aspect of *Cirsodes*; outline of wings as in *Apicia*, the outer margins being rounded, with scarcely perceptible subangulation at the extremity of the third median branch on all the wings; body unusually slender, the antennæ filiform; legs rather stout.

6. *Syncirsodes straminea*, n. s.

Pale straw-yellow; the thorax, base of abdomen, and basal area of the wings sprinkled with a few black scales; primaries crossed by two ill-defined ochraceous stripes, oblique and sub-parallel, the first across the basal third, the second, which is bounded internally by a deeper-coloured line, running from apex to just beyond the middle of inner margin; a greyish subapical dash upon the oblique line; secondaries whitish on the costal and basal areas, crossed beyond the middle by two very ill-defined subparallel stramineous stripes a little deeper than the ground colour, the inner one bounded internally by an indistinct ochraceous line, straight, abbreviated, not reaching the costal margin, the outer one slightly undulated; head white, antennæ pearly whitish; wings below sericeous straw-yellow, more densely mottled with blackish scales towards the base than on the upper surface; stripes as above, but greyish, the outer one of the primaries formed of two closely approximated greyish

stripes, slightly diverging from the apex to the first median branch, where the outer one terminates abruptly; abdominal border of secondaries whitish; body stramineous. Expanse of wings, 45 mm.

"From Reed's collection."—*T. E.*

Rumia, *Dupon.*

7. *Rumia aurantiacaria.*

Rumia aurantiacaria, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 90, n. 1; pl. 7, fig. 7 (1852-4).

No exact locality noted.

The female is much more densely mottled and striated with red-brown and grey than the male.

Var. *simplicior.*

♂. Differs from the typical form in having only a minute blackish dot, or even nothing, in place of the large black-edged grey spot on the internal border, near the external angle of primaries. Four examples in the collection.

Perusia, *Herr.-Sch.*

8. *Perusia præcisaria.*

♂ *Perusia præcisaria*, Herrich-Schäffer, Auss. Schmett. fig. 415 (1850—69).

♀ *Numeria ? inusta*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxix., fig. 11 (1875).

The No. ("63") is omitted from Mr. Edmonds' notes, so that I cannot tell the exact locality of this and the following forms placed with them.

Var. ? *conspersa.* (Pl. XVI., fig. 1).

♂. Smaller than the ordinary male, the yellow areas on the primaries mottled all over with ferruginous. Expanse of wings, 22 mm.

The male figured by Herrich-Schäffer from Venezuela rather more nearly approaches the female than the males before me, the discal grey-bordered red belt being narrower, and separated at its inferior extremity from the interno-basal patch; in the five typical Chilian males collected by Mr. Edmonds the band and patch are confluent, the former being about twice the width of that in Herrich-Schäffer's example.

The following two species must, I think, be distinct, though associated with *P. præcisaria* in the collection; the grey bands on the under surface of the primaries are absent from both of them, though very conspicuous in *P. præcisaria*; from one another they differ in pattern on the upper surface, and that in a very marked degree.

9. *Perusia rubripicta*, n. s.

♂, ♀. Primaries above deep gamboge-yellow, irrorated with red, most densely on the basal and external thirds, which are bounded by ill-defined lines of the same red colour converging towards the inner margin; a minute grey dot at the end of the cell; male with the costa near apex flecked with grey; female with an almost pyriform lilac-bordered grey subapical costal spot; secondaries sericeous-white, with sulphur-yellow fringe; internal margin slightly rosy, with white fringe; thorax gamboge-yellow, with a central red spot; head white; abdomen pearly white; under surface shining creamy white; costal and apical areas of wings yellow; a short diffused oblique red apical dash on the primaries, male with the costal margin blackish at apex. Expanse of wings, 25 mm.

♂. Var. ? *ignescens.*

The primaries above shining reddish golden-yellow, mottled with grey; fringe, costal margin, and base of inner margin gamboge-yellow; antennæ dull yellowish; head and thorax yellow; a reddish spot at the base of each tegula, and a triangular patch of the same over the centre of the metathorax and base of abdomen, the latter flesh-tinted; discoidal area of primaries on the under side mottled with grey, and slightly tinted with rose-colour. Expanse of wings, 23 mm.

I feel some doubt as to the identity of this form with *P. rubripicta*; but there is only one example of it in the collection, so it seems safer for the present to regard it as a remarkable variety; there are also two males of what I should think are undoubted varieties of *P. rubripicta*, but which differ from the typical form in having the basal and external areas much less densely irrorated or mottled with red (the external area being in fact almost wholly yellow), and in the limiting lines of these areas being spotted here and there with grey, the outer

line commencing upon the costa in a more or less defined triangular patch of red scales; it approaches *P. citrinata* of Snellen, from Jamaica.

10. *Perusia maculata*, n. s.

♂, ♀. Primaries above gamboge-yellow, sprinkled with very minute red-brown scales (only visible with a lens), and divided into three areas by a slightly curved series of three red-bordered blackish spots across the basal third, and a discal transverse series of eight similar spots just beyond external third, and inangled near the costa, the third and last of these spots large in the female, in which all the spots are larger and more strongly defined than in the male; the basal and apical areas and inner margin in the female sometimes irregularly mottled with similarly coloured spots and dots; a small black disco-cellular spot; secondaries pure sericeous-white, with sulphur-yellow fringe; a few lilacine-grey spots on the abdominal border; thorax gamboge-yellow, sometimes crossed by a grey-spotted reddish band; antennæ and abdomen pearly white; wings below sericeous-white, with broad diffused yellow costal areas and fringe; male with an oblique lilacine dash near the base of the costal border of primaries; the blackish spots of the upper surface more or less strongly represented by lilacine-grey spots, but many of them wholly wanting; secondaries with a discal series of from three to six blackish dots upon the veins, the first three being always present; body below pearly white. Expanse of wings, ♂ 21 mm.; ♀ 30 mm.

Var. *flava*.

♂, ♀. Differs from the typical form in the absence of all the red-bordered blackish spots on the wings, excepting the disco-cellular and the third discal spots, which are represented by minute blackish dots; on the under surface the third discal alone is present, but some examples show slight indications of the dots on the veins of the secondaries. Expanse of wings, 25 mm.

I think there can be little doubt but that this is a genuine variety or sport of *P. maculata*.

GYNOPTERYX, *Guenée.*

11. *Gynopteryx plagiata*, n. s.

Primaries above ochreous, with three brown-edged and speckled ash-grey patches; one oblong at base of costal border, the second pyriform at apex, the third almost B-shaped, near external angle: a small rounded disco-cellular spot of the same colours, a second still smaller at basal third of submedian vein, a grey dot above it on the median vein; four increasing white-pupilled blackish dots between the two external patches; secondaries stramineous, with an oblique ash-coloured patch, edged in front and behind with brown, at anal angle; body stramineous; head whitish; under surface ochreous, indistinctly flecked with darker dots; primaries with the apical patch as above, but the other markings only represented by small diffused grey spots; secondaries with a small blackish disco-cellular dot, and a discal series of six white-centred dark grey spots; internal borders of all the wings whitish. Expanse of wings, 41—42 mm.

"From Reed's collection."—*T. E.*

Allied to the "*Hyperythra*" *syctaria* of Walker, from Venezuela, and not unlike *Heterolocha xanthiaria* of Guenée.

EROSINA, *Guenée.*

12. *Erosina cervinaria* (Pl. XVI., fig. 4).

Ennomos cervinaria, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 82, n. 2 (1852-4).

"Cordilleras of Cauquenes, in January."—*T. E.*

This species, if rightly determined, has a second, but indistinct, oblique angular line from the costa to the inner margin, and below the cell, almost parallel to the arched discal line mentioned by M. Blanchard; though his description of it, "una linea transversal poco sinuada," is hardly characteristic.

TETRACIS, *Guenée.*

13. *Tetracis chilenaria* (Pl. XVI., fig. 2).

♀ *Ennomos chilenaria*, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 88, n. 1; pl. 7, fig. 4 (1852—4).

No exact locality given.

Blanchard's figure is incorrect in representing the species as yellow, with an orange outer border; the whole insect, excepting the interno-basal area of the secondaries, is washed with orange, but the ground tint varies in intensity from pale buff in the lighter males to reddish orange in the darker females; the discal stripe is confined to the primaries in the males.

Var. *definita*.

Differs from the typical form in having the white line across the primaries edged internally with orange or reddish; the apex also more or less tinted with orange, and the black costal dot at basal third replaced by an oblique orange dash, such as one sees in some females. Expanse of wings, 41 mm.

"From Reed's collection."—*T. E.*

It is a significant fact, as regards the weight to be accorded to the decisions of collectors touching specific or varietal characters, that this, an undoubted variety of *T. chilenaria*, and the following, which in my belief is only a slightly more marked variety, have been unhesitatingly separated under different numbers; whereas forms differing not only in pattern, but even in structure, have been placed together. The fact is that collectors as a rule are guided more by seeing specimens flying together in the same locality, or the reverse, than by an actual study of the specimens themselves; and when the cabinet-naturalist insists upon regarding two or three allied species as distinct, he is at once informed of the crushing fact that they all fly together; indeed one collector informed me that he had taken the types of two very distinct species *in copulâ*, nor would he be convinced of the contrary, even when I had proved to him that both were females: Mr. Edmonds, though he is too good an entomologist to make a mistake of this kind, has nevertheless, to the best of my belief, made too much of the present species, and not quite enough of some others far more distinct.

Var. *continua*.

The white line replaced by a red-brown one, with pink outer edge, and diffused golden ochreous borders; this line is also represented on the secondaries by an abbreviated red-brown line from the lower subcostal branch to the abdominal margin. Expanse of wings, 44 mm.

"Las Zorras, in February."—*T. E.*

14. *Tetracis edmondsii*, n. s.

♀. Primaries bright ochreous, crossed from apex to outer two-sevenths of inner margin by a slightly sinuous white line with testaceous inner edge; a black dot at the end of the cell; secondaries creamy white, washed with cupreous-orange at anal angle, where the fringe is blackish, remainder of the fringe tinted with cupreous-orange at the base, and spotted with blackish at the extremities of the veins; an abbreviated sinuous orange discal line, with snow-white outer edge; thorax pale ochreous, abdomen creamy white; under surface pale shining stramineous; primaries with a purplish black undulated line from apex to the middle of the interno-median interspace, representing the stripe of the upper surface; fringe golden orange, with black dots at the extremities of the veins; secondaries with a small spot at the end of the cell, and a discal series dark brown, the latter connected by an undulated ochreous line; dark brown dots on the fringe as above. Expanse of wings, 45 mm.

"Valdivia; from Reed's collection."—*T. E.*

Allied to the preceding species, but unquestionably quite distinct.

Macrolyrcea, n. g.

Form of wings almost as in *Lyrcea*; the primaries being strongly angulated (much the same as in *Sabulodes*), apex very acute; the secondaries narrow, the greatest measurement being from base to apex; antennæ simple; body longer and far more robust, with the palpi much longer, the terminal joint exposed; aspect of *Metrocampa*.

15. *Macrolyrcea mœsta*, n. s.

Primaries above reddish brown, sericeous; the central third occupied by a slightly paler and greyer belt, contracted towards the inner margin, and bounded by the ordinary lines, which are dark grey; the inner line irregularly angulated, the outer one straight; a black dot at the end of the cell; a white spot at outer fourth of submedian vein; an indistinct zigzag line (obsolete in the female) just beyond the central belt; secondaries paler and greyer than the primaries, the external half washed with reddish or cupreous-brown in the female; disc crossed by three dusky lines, scarcely distinguishable in the female, undulated, and relieved by vague whitish spots

in the male, the veins being in this sex bordered with pale cupreous-brown; body greyish or whitish brown, slightly redder in the female; abdomen sericeous; under surface whitish ash-colour, minutely and sparsely irrorated with blackish scales, a broad brown discal belt bounded by slightly darker lines and traversed by a sinuated whitish line, its inner edge straight and its outer edge dentate-sinuate; primaries with an indistinct dusky litura upon the disco-cellulars; secondaries with a black spot crossed by white veins at the end of the cell; legs and antennæ whity-brown. Expanse of wings, ♂ 44 mm.; ♀ 48 mm.

"Pines Valley, in December."—*T. E.*

The simple antennæ and ovate secondaries prevent my placing this species in *Metrocampa*.

Sabulodes, *Guenée*.

16. *Sabulodes infelix*, n. s.

Fuliginous-brown; wings sericeous, with slightly darker external area; irrorated with darker scales, and traversed towards the outer border by an ill-defined whitish-speckled dusky stripe; primaries with a second, even less distinct, stripe across the basal third, and a black dot at the end of the cell; abdomen slightly paler and greyer than the thorax; under surface ash-grey, the wings slightly brownish and irrorated with darker scales; traversed towards the external border by an irregularly crinkled dusky line; secondaries with a black dot at the end of the cell; abdominal border whitish; antennæ below clay-coloured, tibiæ and tarsi slightly brownish. Expanse of wings, 42 mm.

"Las Zorras, in December."—*T. E.*

Paragonia, *Felder*.

The female only is figured by Felder and Rogenhofer; in this sex the angle of the primaries is developed into a well-defined but obtuse hook, as in the "*Clysia*" *succedens* of Walker; the entire form being an exaggeration of *Ennomos*; the male, however, has the form of *Tetracis*, but with strongly pectinated antennæ, as in *Endropia*.

Whether the six following forms are species or only well-defined varieties can only be absolutely proved by

breeding; but, judging by analogy, they ought to prove to be distinct though allied species, and therefore as such I must provisionally regard them.

17. *Paragonia arenosa*, n. s.

♂. Sandy yellow, densely irrorated with black atoms; primaries crossed, at basal and external thirds, by two oblique scarcely perceptible pale stripes, edged internally at their extremities with greyish and black scales; both of these stripes are inangled close to the costa; secondaries crossed in the middle from second subcostal branch to inner margin by a similar, but not angulated, stripe; body whitish; wings below, sandy yellow, black-speckled, with white internal borders; primaries with two abbreviated subapical zigzag white lines on the costal area, the inner one black-edged; body sandy yellow. Expanse of wings, 42 mm.

♀. Considerably paler than the male; the markings greyer, apical borders greyer; fringe with dusky spots at the extremities of the veins; secondaries with the costal area broadly white; wings below pale sandy yellowish, black-speckled; internal borders white; primaries with the costa at apex white; the greyish stripes of the upper surface better defined, the outer one zigzag towards the inner margin. Expanse of wings, 46 mm.

"Valparaiso, throughout the year; Valdivia, in January."—*T. E.*

This note respecting the localities and times of appearance is referable not to *P. arenosa* only, but to the entire series of *Paragoniæ* in the collection; nothing can be more improbable than that the same species should occur throughout the year in any locality, and the fact that, in Valdivia, it was only obtained during January is evidence of the strongest kind that not one but several species are here represented. I sincerely hope that the next lepidopterist who visits Valparaiso will carefully collect and label specimens of *Paragonia* with the date of capture during every month of the year, for I feel confident, if this is done, the specific distinctions of most, if not all, of the forms which I separate here will be satisfactorily established.

18. *Paragonia squamosa*, n. s.

♂. Reddish clay-colour, densely irrorated with black atoms; greyish towards the external border, sericeous; primaries crossed by two widely separated undulated yellowish stripes, not extending to costal margin; a small black spot at the end of the cell; fringe golden cupreous; secondaries with a single slightly undulated central stripe; costal area whitish; body paler than the wings; the vertex of head, antennæ, and abdomen whitish; under surface of wings dark clay-coloured, clouded and mottled with grey, speckled with black; internal borders white; fringes, as above, golden cupreous; costal margin of primaries golden; two brown-edged white dashes on the costal margin near apex; body below flesh-tinted, the legs pearly white. Expanse of wings, 43 mm.

The undulated stripes across the wings seem to offer a good distinctive specific character, apart from coloration.

19. *Paragonia turbida*, n. s.

♂. Whity-brown, tinted towards the base of the wings with yellowish, and densely irrorated with blackish; primaries crossed at basal third by a deeply undulated ill-defined greyish stripe, and at external third by a whitish oblique stripe, which joins an oblique blackish dash at an angle close to costal border; a well-marked blackish disco-cellular spot; fringe golden brown, blotched with blackish; secondaries crossed in the middle by an ill-defined, nearly straight whitish line; fringe as in primaries; body creamy whitish; wings below sandy yellowish, clouded and mottled with grey, and speckled with black; internal borders white; black disco-cellular dots; primaries with a subapical oblique black-edged white costal dash joining an abbreviated greyish discal line; a white spot at apex; body and legs below sandy whitish, speckled with blackish. Expanse of wings, 40 mm.

♀. Stramineous, speckled with blackish; primaries crossed by two stripes agreeing in form with those of the male, but dark grey; area enclosed between these stripes crossed transversely from costa to inner margin by a rather broad, internally diffused, red-brown band; a black disco-cellular spot; a greyish subapical costal spot,

and a second greyish spot on the external border just below the angulation of the wing, near to which are two conspicuous black spots; fringe spotted with blackish; secondaries with an abbreviated straight greyish brown stripe from the end of the cell to the inner margin, and an arched grey stripe from the costa to the last mentioned stripe; body pinky whitish, sericeous; wings below nearly as above; body creamy flesh-coloured, speckled with blackish; tarsi banded with blackish. Expanse of wings, 39 mm.

20. *Paragonia carnea*, n. s.

♂, ♀. Male golden stramineous, female pink; sparsely black-speckled; primaries crossed by two dark grey stripes, the first zigzag, just beyond basal third, the second at external third, oblique and inangled near the costa; two red-brown or black spots near the angle of the outer margin, as in the female of the preceding species, and sometimes two more at apex; fringe more or less varied with blackish; female with a central transverse diffused ferruginous band, and usually with the outer margin slightly blackish just below the angle; secondaries with whitish costal area, and darker external area; a nearly straight central dark grey stripe, followed by a dentate sinuate grey stripe; body yellowish or pinky whitish; wings below rather browner than above, with blackish disco-cellular spots; stripes nearly as above, but the inner one on the secondaries sometimes absent. Expanse of wings, 42—43 mm.

Three pairs.

This species has three other forms which appear to me to be simply varieties; the first of these is rather darker in both sexes, has the stripes across the wings darker and bordered with whitish, the inner stripe less zigzag, and no blackish or brown spots near the angle of the primaries; the outer dentate-sinuate stripe of secondaries is also indistinct (two pairs); the second has a sandy reddish male and greyish female; the other characters differing almost as in the first variety (three examples); the third is considerably darker in both sexes than the second, the male deep sandy reddish, with the outer stripe of primaries and the central stripe of secondaries black-brown, with whitish external margin; the inner stripe of primaries indistinct, less zigzag than in the

type; the dentate-sinuate stripe of secondaries obsolete in the male; the female with dark grey central band, between which and the outer stripe the ground colour is yellowish; borders of all the wings also dark grey (one pair); the following appears to be a fourth variety, but is better marked than the preceding ones:—

P. carnea? var. *rosea.*

Rose-brown, with the stripes dark red-brown, the outer stripe sometimes with a cream-coloured outer edge; fringes red-brown; a small black disco-cellular spot on the primaries; dentate-sinuate stripe of secondaries obsolete; female with two red-brown spots near the angle of the primaries, which is slightly blackish, and a diffused central red-brown band; outer borders red-brown; body pinky whitish; wings below rather browner than above, with white internal borders, markings rather less defined than above; apex of primaries white; body red-brown. Expanse of wings, 41—42 mm.

21. *Paragonia deustata* (Pl. XVI., fig. 3).

♀ *Paragonia deustata*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxiv., fig. 8 (1875).

The male is of a sandy ochraceous colour, and, as in the allied species, agrees with *Tetracis* in the form of its wings; but the pattern is the same as in the female.

Two males.

The conspicuous black spot on the outer margin of the primaries at once identifies this species, apart from other characters.

22. *Paragonia cinerea*, n. s.

Allied to the preceding, from which it differs in its silver-grey coloration, the approximation of the stripes across the primaries, the red-speckled transverse stripe, the black spot on the outer margin replaced by a congregation of blackish scales, near to which are two small red spots, and, in fact, the ill-defined character of all the markings; under surface silver-grey, black-speckled; primaries with two darker grey lines converging towards the inner margin; costa snow-white towards apex; a dusky spot on the outer margin; a very ill-defined submarginal grey stripe slightly darker than

the ground colour; secondaries with a black discocellular dot, but no other markings. Expanse of wings, 43 mm.

One female only.

AZELINA, *Guenée.*

23. *Azelina felderi*, n. s. (Pl. XVI., fig. 5).

Colotois ? chilenaria, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxiv., fig. 7 (1875).

The male resembles the female, both in form and markings; the figure of the supposed male in the 'Reise der Novara' is incorrect in outline, being represented as more like the female than it really is; it is a decidedly longer-winged insect, and not dentated like *Azelina felderi*; in fact it is not an *Azelina*; curiously enough, the two forms were associated by Mr. Edmonds, which renders it probable that they frequent the same flowers.

The pattern of Felder's supposed sexes is perfectly dissimilar.

"Las Zorras, at flowers, in February, March, and April."—*T. E.*

24. *Azelina corticalis*, n. s.

Form of *A. anceta*; base of primaries ochraceous, with two small black spots at the inner angle, bounded by a straight red-brown band, partly edged externally with black, and followed by a broad sordid white belt with angulated olivaceous outer margin; this belt is spotted below the cell with blackish, and dotted here and there with the same colour; an oblique costal dash just before the middle; external two-fifths pale olivaceous; an ill-defined white-speckled dentated black stripe just beyond the broad white belt; a subapical slightly oblique olive-brown abbreviated band with snow-white zigzag outer edge, from which one or two longitudinal blackish dashes run to the outer margin; external angle clouded with red-brown and black, and spotted with white; secondaries pale sericeous pinky brown, flecked with grey, and traversed by two externally white-edged dentated black lines, the first just beyond the middle, the second submarginal, interrupted; a black marginal line; body very pale sericeous greyish brown; a black spot on the collar; primaries below pale sericeous bronzy brown,

whitish at apex; secondaries silvery whitish, sericeous, flecked with brown, and with two brown lines similar to those of the upper surface; body pale brown. Expanse of wings, 31 mm.

"La Union, in February."—*T. E.*

ODONTOPERA, *Steph.*

25. *Odontopera fragilis*, n. s.

♂. Primaries above shining lilacine-grey, with bronze-brown reflections; a scarcely perceptible irregularly undulated slender blackish line before the middle, and a more distinct widely undulated and angulated slender black line beyond the middle; a black spot at the end of the cell; secondaries silvery grey, indistinctly irrorated with brown, crossed beyond the middle by a slightly angulated slender black-brown line; an abbreviated blackish anal dash; veins slightly golden towards the extremities; body pale greyish brown, with golden reflections; under surface paler and more sericeous than the upper surface; primaries without markings; secondaries with a blackish spot at the end of the cell, and almost sigmoidal slender blackish line beyond the middle, and incomplete and very indistinct irregular submarginal line. Expanse of wings, 42 mm.

♀. Primaries above bronze-brown, with a slight greyish tint in certain lights; outer border of a slightly deeper colour, markings as in the male; secondaries grey, wtth bronze-brown veins, markings as in the male; body greyer than in the male, especially on the under side; under surface as in the male, excepting that there are faint traces of the upper surface markings upon the primaries. Expanse of wings, 46 mm.

♀ var. Primaries pale sandy yellow, with deeper coloured stripes (agreeing in form with the slender black lines on the types) and outer border; a conspicuous black disco-cellular spot; body also yellowish; otherwise as in the typical form. Expanse of wings, 48 mm.

"Las Zorras, in February."—*T. E.*

DECTOCHILUS, n. g.

Now that species are so rapidly being added to our collections, it becomes necessary to pay attention to all marked differences of structure. I therefore propose

under this name to distinguish all species hitherto referred to *Azelina* (*Gonodontis*, Hübn.), in which the antennæ of the males are simple: M. Guenée gives as his character, "*Antennes variables*"; they do not, however, vary in the same species, or in very closely allied species.

26. *Dectochilus autucaria.*

♀ *Gonodontis autucaria*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxiv, fig. 20 (1875).

Both sexes vary considerably in the tint of the primaries, which, in Mr. Edmonds' examples, is much darker than in Felder's figure: the size of male examples varies from 46 to 43 millimetres in expanse; the smaller specimens have also more strongly defined markings, including a well-defined, minutely dentate-sinuate, submarginal whitish line bounding a series of black or grey spots; the secondaries are also whiter than in the larger variety.

In my "Revision of the Lepidopterous Genus Azelina" (Ann. & Mag. Nat. Hist., Ser. v., vol. viii., pp. 29—46, Jan., 1881) I have mentioned *G. autucaria*, of Felder, as "probably a species of *Eurymene*, but certainly not an *Azelina*," and this is precisely the impression conveyed by Felder's figure, which represents an insect not unlike *Eurymene alcoolaria*; but I expect that the figure is either undercoloured or taken from an unusually pale example; it ought to have been regarded as an *Azelina* in Guenée's sense, which admits the widest modifications in the antennal structure. Apart from the non-pectination of its antennæ, *D. autucaria* is not unlike the *Crocallis tusciaria* of Europe.

Monoctenia? *Guenée.*

M. Guenée places this genus in a separate family, which he calls *Œnochromidæ*, and, judging by the Australian species alone, it seems very distinct; but the two following species, which, excepting that their antennæ are not quite so broadly pectinated (though quite as much so as in *Œnochromia*), agree well with the Australian types, are evidently not sufficiently unlike *Azelina* to be referred to another family; at any rate that is my present opinion; but, should breeding show great larval differences necessitating such a disruption

of forms apparently allied, it will only prove how important it is for collectors in the first place not to jump at conclusions, and in the second place for cabinet-naturalists not to accept such conclusions as indisputable facts, as has apparently been done by Felder in the present instance.

27. *Monoctenia chilenaria* (Pl. XVI., fig. 13).

♂ *Colotois ? chilenaria*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxiv., fig. 6 (1875).

"Las Zorras, at flowers, in February, March, and April."—*T. E.*

The form of the wings, as already stated under *Azelina felderi*, is not correctly represented in the figure; they agree with those of *Monoctenia falernaria* ♂,* the costal margin being much elongated, and the outer margin, excepting at apex, very slightly dentated; the sexes agree in pattern and coloration. I have seven examples before me.

With the above were also four specimens of what I must consider as a very distinct species, the primaries being distinctly less angulated than in *M. chilenaria*, and the pattern different.

28. *Monoctenia dentilineata*, n. s. (Pl. XVI., fig. 12).

♂. Primaries sordid white; the costal border, base, centre of interno-median area, and a series of longitudinal dashes close to the outer margin, brown; an irregular zigzag dark brown line across the basal third, and a strongly dentated blackish discal line from costa to inner margin; two fine black basal dashes, a conspicuous black spot at the end of the cell, and a marginal series of smaller black spots; secondaries white, the external border washed with brown; a spot at the end of the cell, a strongly dentated discal line (marked with black dashes on the veins), and a marginal series of small spots, dark brown; head, collar, and tegulæ grey, with white borders; thorax white; abdomen whitish, with faint bronze-brown reflections; under surface shining milky white; markings ill-defined. Expanse of wings, 39 mm.

* And still more exactly with *M. himeroides*, from Tasmania.

♀. Greyish white, irrorated sparsely with black atoms; the primaries distinctly silvery grey; the lines upon the male are here only represented by short longitudinal black dashes on the veins, and are wholly obliterated in some examples; the outer margin outlined by an undulated slender black line connecting the marginal black dots; secondaries with traces of the dentated line in addition to the dashes upon the veins: these are, however, obliterated in some examples; a black spot at the end of the cell, and a marginal series; thorax distinctly grey. Expanse of wings, 43 mm.

"Las Zorras."—*T. E.*

EUANGERONA, n. g.

Allied to *Angerona*, but differing in its more slender body, and the simple antennæ of the male; the wings a little narrower; outer margins of all the wings regularly obtusely denticulated.

29. *Euangerona valdiviæ*, n. s.

Primaries above sericeous, sandy testaceous, speckled with black; a pale oblique subangulated line beyond the middle; a small blackish disco-cellular spot; secondaries paler than the primaries, sparsely and finely irrorated with blackish on the anal area; body ochraceous; wings below pale sandy testaceous, the costal margins and external areas speckled with blackish; basi-abdominal area of secondaries whitish; body below golden ochraceous; pectus paler than venter, the legs very pale; anterior tibiæ grey. Expanse of wings, 37 mm.

"Los Ulmos, Valdivia, in February."—*T. E.*

MICROCLYSIA, n. g.

Aspect and coloration of *Endropia*, but the antennæ of the male simple; outline of wings not unlike *Metanema*; the primaries acute at apex, and with the outer margin obtusely dentated and angulated at the extremity of the third median branch; the secondaries with almost rectangular dentated outer margin; body scarcely extending beyond the secondaries; palpi forming a point in front of the head, the terminal joint very short; legs long and slender.

30. *Microclysia reticulata*, n. s.

Primaries above flesh-coloured, transversely striated with red-brown, and sometimes mottled with the same colour upon the costal border; two widely separated subparallel oblique dark brown lines, elbowed near to the costa, the outer one with a slight angle between the first median branch and submedian vein; an elbowed red-brown streak between the lines, but frequently diffused externally, so as to unite with the outer line and form a tapering red-brown band; external border more or less suffused with red-brown; secondaries stramineous, changing to flesh-colour below the median vein, striated or reticulated with red-brown, and crossed from the radial vein to the abdominal margin by a slender dark brown line, edged externally with greyish white and sometimes bounded internally from second median branch to abdominal margin by an abbreviated red-brown band; thorax usually flesh-coloured, abdomen stramineous; under surface stramineous; wings with transverse greyish striations; small blackish disco-cellular spots; primaries with two fine lilacine-grey lines nearly resembling those of the upper surface in character; secondaries crossed by a single arched or subangulated discal line. Expanse of wings, 33—38 mm.

Var. *ferruginea*.

♂. Primaries above almost wholly dark ferruginous, the costa only being mottled with flesh-colour; the lines bordered with lilacine-grey; the margin more acutely denticulated; secondaries with the anal area to the median vein dark ferruginous; the line bordered with grey; thorax and base of abdomen with ferruginous scales; under surface altogether darker and redder than the typical form, the striations and lines broader and more defined. Expanse of wings, 33 mm.

"Valparaiso and Valdivia, December to February." —*T. E.*

Digonis, n. g.

Allied to *Metanema*, but the male antennæ almost simple, finely serrated, not pectinated; primaries with the apex acute, a second acute angle at the extremity of the third median branch, the margin between these two angles excavated into a shallow sinus; margin from the

second angle to the external angle of the wing straight and oblique; secondaries with nearly straight costal margin; outer margin at apex very convex, projecting beyond the external angle of primaries, the margin slightly sinuous throughout, and slightly angulated at the extremity of the third median branch; palpi rather short, slightly deflexed at the apex, which projects slightly in front of the head; legs long and slender.

31. *Digonis aspersa*, n. s.

Primaries above very pale bronzy olivaceous, irrorated with black atoms; "extrabasilar" line represented by an oblique black-speckled grey costal dash, one or two white dots on the veins, and a grey spot on the internal borders; a black dot at the end of the cell; discal line widely undulated, olivaceous, with pale outer edge, from which little tapering white dots project along the veins; an interrupted submarginal series of black spots; secondaries silvery grey, with bronze-brown reflections, irrorated with black atoms; a discal series of white-tipped black dots; body pearly grey; under surface silvery grey, with bronze reflections; wings black-speckled, and with a continuous discal series of white-tipped black dots; primaries with the apex white, and two or three subapical black spots. Expanse of wings, 43 mm.

"Pines Valley, in December."—*T. E.*

This, the largest and rarest species in the genus, may be regarded as the type; it somewhat reminds one of a *Clysia*, but differs structurally.

32. *Digonis alba*, n. s.

Primaries above pale sericeous lilacine-grey, reticulated with white; an indistinct slightly blackish disco-cellular spot; a discal angulated series of minute black dots, only distinct towards the costa; secondaries sericeous-white, speckled with grey; body white, sparsely speckled with grey; under surface shining white; wings sparsely grey-speckled. Expanse of wings, ♂ 33 mm.; ♀ 36 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

33. *Digonis cuprea*, n. s.

Primaries above golden bronze, with blackish speckled costa; extrabasilar line elbowed and slightly sinuous in the male, zigzag in the female, more or less dark red-brown; discal line of the same colour with pale outer edge, nearly straight, and elbowed close to the costa; a black dot at the end of the cell, and two black subapical spots; secondaries greyish brown, with black-speckled abdominal border; an abbreviated indistinct blackish line running to anal angle; fringe golden bronze; body pale greyish brown; under surface silvery grey, irrorated with black; wings with a continuous discal series of white-tipped black dots; primaries with two subapical black spots; fringe tipped with gold. Expanse of wings, 34—35 mm.

Var. *olivacea*.

Primaries above darker, of a more olivaceous tint; the outer or discal line bounded internally by a broad tapering olivaceous belt; an angular interrupted submarginal series of blackish spots; secondaries also darker, and with the abdominal border more or less suffused with golden bronze; thorax brownish; abdomen dark grey; under surface dark leaden grey, irrorated with black; the secondaries densely black-speckled; otherwise as in the typical form. Expanse of wings, 32—33 mm.

Var. *fusca*.

Wings greyish brown, the primaries darker, with cupreous reflections, an elbowed dark brown stripe between the ordinary lines, the interval between which and the outer line is rather darker than the ground colour; body greyish, the thorax slightly brownish; under surface browner than in the type; fringe tipped with bronze-brown; otherwise similar. Expanse of wings, 31—32 mm.

"Valparaiso, throughout the year."—*T. E.*

For the reason already noted,—that it is not likely that the same species can occur throughout the year,—I regard the var. *fusca*, named above, as possibly a distinct species; though, on account of the great similarity in its markings, I hesitate at present to separate it specifically.

34. *Digonis punctifera*, n. s.

Primaries above dark ferruginous-brown, sericeous; costal margin speckled with whitish atoms; an irregularly zigzag blackish line across the basal third; a black dot at the end of the cell, and a white-dotted bisinuated grey-edged black line beyond the middle; fringe pale brown, with a central stripe and the tips, dark brown; secondaries shining pale grey; fringe pale brown, with darker tips, and central stripes; male with a pale bordered dusky macular discal stripe; thorax dark brown, abdomen whity-brown or greyish; wings below shining silvery grey, tinted with bronze-brown towards the margins; costal border of primaries and entire surface of secondaries speckled with black; an angulated discal line, spotted with black upon the nervures; veins between this line and the outer margin whitish in certain lights; a minute black disco-cellular dot on the primaries, and a conspicuous spot on the secondaries; primaries of female with a double blackish costal spot near the apex, and the apex itself white; body brownish. Expanse of wings, ♂ 30 mm.; ♀ 26 mm.

Var. *maculosa*.

♀. Primaries whity-brown, mottled all over with white and black-brown; a ≶-shaped blackish line across the basal third, a small black dot at the end of the cell, and a bisinuated white stripe beyond the middle; secondaries silvery; thorax brown, abdomen greyish brown; under surface of wings paler and more silvery than in the typical form. Expanse of wings, 29 mm.

The following seem also to be varieties, though differing from the typical form and from the other species of the genus in the shape of their primaries, the apex being more prominent and the angle of the outer margin less so; these differences are, however, less strongly marked in the females than in the males.

Var. *acuminata*.

♂, ♀. Primaries above greyish brown, a dark brown tapering band bounding the inner edge of the discal line, the male with the external area more silvery, the female with the costal border and veins yellowish; markings as in the typical form; secondaries of both sexes as in the

typical male; under surface as in the type. Expanse of wings, ♂ 31 mm.; ♀ 26 mm.

Var. *terranea*.

♂, ♀. Primaries cupreous reddish, varied with greyish brown and whitish, and speckled with black; otherwise as in the typical form. Expanse of wings, ♂ 27 mm.; ♀ 28 mm.

Var. *fumosa*.

♂. Primaries dark smoky brown, markings indistinct; secondaries and under surface as in the type. Expanse of wings, 28 mm.

"Valparaiso, December to February."—*T. E.*

This appears to be one of the most variable in tint and outline of the Chilian Lepidoptera; the only form which shows any real difference of pattern, however, is var. *maculosa*.

BOARMIIDÆ.

Opisogonia (*Herr.-Sch.?*), *Felder*.*

35. *Opisogonia tensata*.

♀ *Opisogonia? tensata*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxix., fig. 18 (1875).

♂. "Coral, in March."—*T. E.*

The male bears considerable resemblance to the Japanese *Hemerophila subspersata* of the same authors, which (by the way) is not a true *Hemerophila*, though allied to that genus.

Hypochroma, *Guenée*.

36. *Hypochroma edmondsii*, n. s.

Nearest to *H. emiliaria*, of Australia; pale sandy yellowish, varied here and there with white, and crossed by numerous parallel undulated grey-brown lines; three of these lines, which are rather broader and blacker than the others, indicate the central belt, which is of the usual form, and the submarginal line; primaries with blackish

* Herrich-Schäffer's description is unintelligible to me—"Eine schöne Art aus Chile. Vorderflügel wie bei *Siona*, Hinterflügel auf Rippe 6 spitz vorgezogen." What does he mean by Vein 6? the only prominent part of the secondaries is at the extremity of vein 4 or 5, whichever way you choose to count; that is, at the third median branch. In my opinion the genus should be quoted as Felder's, since Herrich-Schäffer gives no type.

spotted costal border, the largest spot (which is a combination of two spots) near to apex; a reniform subapical discal blackish spot; a black spot at the end of the cell; body greyish brown, thorax irrorated with whitish; wings below shining white, the basal two-thirds striated with grey; a black spot at the end of each discoidal cell; two discal black lines, the inner one slightly irregular, the outer one commencing in a black subapical costal patch, nearly straight on the primaries and arched on the secondaries; external border more or less flecked and blotched with grey; a slender interrupted marginal black line; body below pearly white. Expanse of wings, 35 mm.

"Las Zorras, in February."—*T. E.*

The female is less distinctly marked than the male.

HONORANA, *Blanch.*

37. *Honorana notaturia.**

Honorana notaturia, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 92, n. 1 (1852-4).

Honorana notutaria (sic), Blanchard, *l. c.*, Atlas, pl. 7, fig. 8 (1852-4).

"Mountains of the hacienda of Cauquenes."—*T. E.*

This species is very poorly figured; it is much like one of the larger species of *Gnophos*, of a pale ash-grey colour, with very ill-defined markings; the genus differs principally from *Gnophos* in its smaller secondaries.

38. *Honorana æneä*, n. s.

Form and size of the preceding species, greyish brown, with darker striations, and with golden bronze reflections; blackish disco-cellular spots and undulated discal line, spotted with white points upon the veins; primaries with a second but less distinct undulated line before the middle; a slender black marginal line; fringe with a whitish basal line; costal area of secondaries whitish; abdominal fringe snow-white; abdomen silvery grey; under surface silvery white, with slight bronze reflections;

* Probably intended for *notataria*; but, as neither name has any sense, one will do as well as the other; literally, *notataria* means *pertaining to what has been written.*

primaries with the apical half and costal border brownish; a distinct blackish or black undulated discal stripe; a very slender black-dotted blackish marginal line; fringe sordid, slightly greyish; primaries with a minute grey or blackish disco-cellular dot; secondaries with a conspicuous black disco-cellular spot. Expanse of wings, ♂ 49 mm.; ♀ 43 mm.

"Las Zorras, in January."—*T. E.*

The following genus is a puzzling one; having the speckled wings of a *Boarmia*, but the general outline of some of the *Larentiidæ*; I think it is best located here.

Plectroboarmia, n. g.

Aspect of *Boarmia* or *Tephrosia*; but the primaries with very acute apex; costal margin of primaries nearly straight; outer margins of all the wings undulated; secondaries rather small, triangular, the costal vein running close to the subcostal to the second third of the discoidal cell, so as to appear as though it were emitted from it; body rather slender; palpi with long fringe, with small terminal joint, porrect, projecting in front of the head; antennæ simple; abdomen scarcely extending beyond the secondaries; legs long and slender.

39. *Plectroboarmia sordida*, n. s.

Sordid white, sericeous, irrorated with grey and black atoms; an abbreviated oblique bisinuated dusky line from the subcostal vein to the basal third of inner margin, and two better defined approximated transverse slightly undulated discal lines, converging a little towards the inner margin; a very slender black marginal line, spotted with black at the extremities of the veins; secondaries crossed beyond the middle by two very slender indistinct dusky lines, the outer one irregular, and marked upon the veins with short black dashes; outer margin with black edge and spots as on the primaries; under surface whiter, more sericeous, and less densely irrorated with brown and black than above; no dusky lines, but brownish disco-cellular spots; marginal line and spots as above; pectus brown, with darker speckles; venter sordid white, irrorated with blackish. Expanse of wings, 37 mm.

"Las Zorras, in February."—*T. E.*

This seems to me to be allied to Felder's *Bryoptera punctata*, which is not a *Bryoptera*; the species of the latter genus are nearer to *Hypochroma*, and perhaps congeneric with *Gazena*, Wlk.

I may note here that *Tephrosia marmoraria* is *Bryoptera convallata* of Guenée, and *Tephrosia incongruaria* is *Bryoptera canitiata*; thus two more of Walker's species are disposed of.

BOLETOBIIDÆ.

BOLETOBIA, *Boisd.*

40. *Boletobia sericea*, n. s.

Shining greyish white; minutely and rather sparsely speckled with black; primaries with a short longitudinal black dash at the origin of the first median branch, and a discal oblique series of five or six upon the veins; abdomen whity-brown; primaries and body below whity-brown; secondaries white speckled with grey. Expanse of wings, 27 mm.

"Las Zorras, in March."—*T. E.*

GEOMETRIDÆ.

OMPHAX, *Guenée.*

41. *Omphax gnoma*, n. s.

♂. Primaries semitransparent emerald-green, with slender white costal margin; a deeper green discocellular dot; secondaries semitransparent white, greenish at anal angle; top of head and antennæ cream-coloured; thorax green; abdomen white; wings below pale green; costal margin of primaries cream-coloured, becoming ochreous at the base; face crossed in front of the antennæ by a triangular carmine patch; front of face flesh-coloured; anterior legs rose-red, other legs cream-coloured; body below snow-white. Expanse of wings, 30—36 mm.

"Las Zorras, in December and January."—*T. E.*

The smaller form seems to be more numerous than the larger.

EPHYRIDÆ.

EPHYRA, *Duponchel.*

42. *Ephyra semirosea*, n. s.

Wings above dull rose-colour, with the basal and external fourths cream-coloured, bounded by the ordinary lines, which are greyish brown, dotted upon the veins with black; the costal border, excepting at base and apex, an angulated continuous stripe just beyond the cell and parallel to the outer line, and a macular interrupted submarginal stripe, greyish brown; a white spot at the end of each discoidal cell; a marginal series of short, slender, black lines: body cream-coloured; under surface shining white; wings with discal and marginal lines as above; primaries slightly greyish. Expanse of wings, 21—25 mm.

"Valparaiso, in December."—*T. E.*

With this species were five examples referable to the following, though I think it not impossible that the latter may be merely a dimorphic type of *E. semirosea*.

43. *Ephyra notigera*, n. s.

Whity-brown, with chocolate-brown lines and stripes formed exactly as in the preceding species, excepting that the outer line of the secondaries is a little more acutely angular; similar white spots with red-brown edges at the end of the discoidal cells; submarginal interrupted stripe varying from dark greyish chocolate to pale grey, wanting altogether in the female; costal border of primaries speckled with blackish; wings below sericeous-white, with the markings of the upper surface, but the stripes greyer than above; primaries with flesh-coloured costal border; basal half of wing grey; body below shining grey, with pale pink shining legs. Expanse of wings, 21—22 mm.

"Valparaiso, in December."—*T. E.*

Allied to *E. pendularia*.

44. *Ephyra umbrata*, n. s.

Allied to *E. orbiculata*; flesh-coloured, densely mottled and striated with grey; wings crossed just beyond the basal fourth by a black-dotted sinuated grey line, in the

middle by an imperfect grey streak, and towards outer margin by two parallel arched grey stripes ; an angulated series of black spots beyond the cell ; semicircular blackish-edged white spots at the end of the discoidal cells ; wings below shining leaden grey, crossed by a discal series of black points ; body pale sericeous-brown. Expanse of wings, 24—26 mm.

"Valparaiso, in December."—*T. E.*

The under surface of the wings is almost metallic.

IDÆIDÆ.

The species described by Blanchard as *Acidaliæ* are in reality referable to *Psamatodes* ; I have already stated that the name *Acidalia* is preoccupied in the Butterflies, and cannot, therefore, be used here.

Chlorotimandra, n. g.

Allied to *Timandra* ; primaries broad, falcate, with the outer margin strongly angulated at the extremity of the third median branch and deeply sinuate between the latter and the apex ; secondaries small and narrow, the apex formed at the extremity of the first subcostal branch ; the neuration of these wings is extremely simple in the male, the costal vein does not reach the apex, the two subcostal branches are placed upon a long foot-stalk ; the discoidal cell is short, with very oblique disco-cellulars, from the middle of which springs the radial ; the median vein is quite simple or one-branched, and takes the position usually occupied by the submedian ; the latter is extremely short, and represents the internal vein of other moths ; neuration of the female quite normal ; body long and slender ; antennæ of male serrate-moniliform, not pectinated.

45. *Chlorotimandra viridis*, n. s.

♂. Primaries above bright sap-green ; costal margin, two parallel transverse costal dashes, and the sinuated portion of the fringe, purplish brown ; two nearly parallel oblique central olivaceous lines, dotted with white upon the veins ; secondaries greyish brown, with slight bronze reflections and purplish brown fringe ; thorax sap-green ;

antennæ bronze-brown; abdomen rosy brownish; wings below pale green, mottled with grey; fringe purplish brown, excepting towards the external angle of the primaries and the apex of the secondaries, where it is brassy yellowish, but spotted with purplish on the primaries; on these wings also there are three purplish costal spots, from the second of which a brown discal stripe crosses the wing; body below pink. Expanse of wings, 28 mm.

♀. Above pale green; the primaries darker than the secondaries, especially towards the outer margin; the costal margin speckled and spotted with dark purplish brown, the fringe purplish, excepting towards the external angle; the transverse central lines wider apart than in the male, creamy white with dark sap-green margins; a black dot at the end of the cell; secondaries crossed in the middle by an externally white-edged dark green line; the whole surface densely grey-speckled; abdomen whity brown; under surface of a more yellow tint than in the male; the discal stripe carried across the secondaries; all the wings with a black disco-cellular dot. Expanse of wings, 30 mm.

"Las Zorras, in November and December."—*T. E.*

CABERIDÆ.

Syllexis, *Guenée.*

46. *Syllexis lucida*, n. s.

Shining sulphur-yellow or snow-white; in the yellow form the secondaries are paler than the primaries, and the abdomen is pure white; primaries in both forms with a black dot at the end of the cell, and an oblique discal series of grey spots; primaries below paler than above, with creamy white costal border, but no markings; secondaries also with creamy costal border; these borders are also to be seen on the white form; body below creamy white. Expanse of wings, 39 mm.

"Pines Valley, near Valparaiso, in December."—*T. E.*

The primaries above have the same glistening character as some of the white *Liparidæ*.

MACARIIDÆ.

PSEUDALEUCIS, n. g.

Form of wings exactly as in *Mychonia*, of Herrich-Schäffer (Auss. Schmett., fig. 448); coloration more like that of *Aleucis*, and the antennæ of the male distinctly pectinated.

47. *Pseudaleucis misera*, n. s.

♂, ♀. Primaries above shining cupreous-brown, crossed at basal third by an angular blackish line, and in the middle by two undulated subparallel lines elbowed towards the costa, the inner one interrupted by a black disco-cellular spot; external border dusky, with one or two minute whitish dots on its inner edge; a marginal series of black dots; secondaries sericeous greyish white, with bronze or pale cupreous reflections, external area brownish; a slightly sinuated grey line across the middle of the wing; body brown; under surface shining pale greyish or whitish brown, with slight cupreous reflections; indistinctly grey-speckled; a grey discal line angulated on the secondaries, on which wings there is a more or less distinct disco-cellular spot; the female (and perhaps fresh examples of the male) has a small blackish disco-cellular dot on the primaries; these wings also show a submarginal series of ill-defined whitish spots. Expanse of wings, ♂ 34 mm.; ♀ 31 mm.

"Las Zorras, in February."—*T. E.*

48. *Pseudaleucis irrorata*, n. s.

♂. Primaries sericeous cream-colour, irrorated with grey-brown, the base and external border mottled with the same colour; a ≷-shaped blackish line across the basal third, and an externally black-edged, undulated and elbowed, band of greyish brown, flecked with cream-colour, just beyond the middle; a black disco-cellular dot on the band; secondaries whitish grey across the disc, which is traversed by an undulated grey line; fringes of all the wings traversed by two dark grey stripes; body greyish brown; primaries below shining sooty-grey, the costal and external borders speckled with blackish and white atoms; border of apical sinus white; secondaries white, rather densely irrorated with black;

all the wings with black disco-cellular spots, and an undulated arched discal black line; fringe as above; body below sooty. Expanse of wings, 34 mm.

"Las Zorras, in March."—*T. E.*

PHARMACIS, *Hübner.*

The type of this genus is *P. æstimaria*, of Europe; the wings of this species have an undulated outer margin, angulated at the extremity of the third median branch in both primaries and secondaries.

49. *Pharmacis trinotata*, n. s.

♂. Above pale pinky brown, wings striated with grey, and with golden bronze reflections; primaries crossed by two pale-bordered dark brown lines, converging in the centre, the inner one abruptly angulated at the costal border and incurved towards the inner margin, the outer one strongly inarched in the middle; a black disco-cellular dot; external area almost uniformly golden bronze, with three large oval white spots on the median and interno-median interspaces, the last bifid, and three white dots between them and the costa; a marginal series of black dots; secondaries with the external area rather darker than the rest of the wing; bounded internally by a double brown stripe, the inner line of which is dark; a small black disco-cellular dot; under surface greyish white; wings irrorated with darker scales, sericeous; a grey discal line, spotted with black upon the veins; black disco-cellular dots; primaries tinted with brown. Expanse of wings, 30 mm.

♀. Altogether redder than the male, the lines across the wings more distinctly double, those on the primaries a little less curved; the white discal spots rather smaller, for the most part with black centres in some examples, though wholly white in others; a continuous slender black marginal line; under surface cupreous-brown, with the inferior halves of the external borders whity-brown; the whole surface rather densely irrorated with black; markings as in the male. Expanse of wings, 34 mm.

Var. *subocellata.*

♂, ♀. Ground colour above pale shining bronze-brown, markings strongly defined, the external area of

primaries fuliginous, paler on the median interspaces and at apex, with a series of white-edged black spots in place of the white spots of the typical form; a more or less defined similar but subconfluent series on the secondaries; under surface shining whity-brown, irrorated with blackish, and with the normal black spots. Expanse of wings, 35 mm.

A female example also occurs a little redder in tint, with the external area almost uniform in colour, and the ocelloid spots almost obsolete. Expanse of wings, 33 mm.

Var. *horrens*.

♂, ♀. Ash-grey, speckled and striated with black and brown; the lines whitish, with black-brown inner and paler brown outer margins; the external area beyond the outer line of primaries more or less suffused with bronze-brown; the primaries of the male darker and greyer than those of the female; the white spots mottled with black, less distinct on the secondaries than on the primaries; fringes chocolate-brown, tipped with white; under surface almost as in the typical form. Expanse of wings, 36 mm.

A male form of this variety occurs in which the brown striation and mottling is so dense that it would be more correct to describe it as brown, striated and mottled with whitish ash-colour. Expanse of wings, 34 mm.

Whether the following is a distinct species, or only another variety, I shall not attempt to decide: the forms described above may prove to be either species, sports, or polymorphic types; to save confusion, I have considered it best to give them distinctive names, but at the same time to regard them provisionally as varieties.

50. *Pharmacis valdiviata*.

♀ *Scotopteryx? valdiviata*, Felder and Rogenhofer, Reise der Fregatte Novara, Lep. v., pl. cxxvi., fig. 6 (1875).

♂. Paler than the female, and with a submarginal series of white-edged black spots on the primaries; these wings are crossed by two white stripes, as in the female;* Expanse of wings, 33 mm.

* The inner stripe is drawn in the figure, but the colourist has omitted to put the white on.

Var. *albostriata*.

♂. Dark greyish brown, with bronze reflections; the white stripes nearer together upon the primaries, and the whole basal area up to the outer stripe striated with white, the secondaries striated with white all over; all the wings with conspicuous black disco-cellular spots; the submarginal white-edged spots of primaries small and hastate. Expanse of wings, 33 mm.

There is also a rather worn male, in which the wings have a glaucous shade, and the stripes and striations are pale yellowish. Expanse of wings, 34 mm.

51. *Pharmacis clara*, n. s.

Wings above white, slightly washed with cupreous, which gives it a pinky tint; primaries with the basal third and costal border sparsely black-speckled; a slightly curved brownish stripe, elbowed upon the costal border, crossing the basal third; a black disco-cellular dot, an arched black-edged brown discal stripe, followed by a more or less defined zigzag blackish line; apical half of external area and fringe fuliginous-brown, but the apex white, speckled with black; a slender white line at the base of the fringe; secondaries with the basal half black-speckled; a black disco-cellular dot; a black-edged brown stripe across the disc from apex to anal angle; fringe as in primaries; head blackish, thorax pinky whitish; abdomen grey, banded with whitish; under surface white, tinted with pink, irrorated with blackish; wings with black disco-cellular spots, and with discal and marginal series of black dots; fringe dark greyish brown, with slender white basal line. Expanse of wings, 32—34 mm.

"Valparaiso, in November and December."—*T. E.*

Mr. Edmonds appears to have regarded the whole of the forms of *Pharmacis* above described as one species; at any rate they were placed together in a mixed series under one number; they may therefore all be understood to occur at Valparaiso either in November or December; *P. clara*, though only represented in the collection by two females, seems to me to be a distinct species.

52. *Pharmacis mixta*, n. s.

♂. Wings above blackish brown, with bronze reflections, speckled and striated with whitish; crossed in the middle by a blackish stripe, beyond which is a slightly undulated black-dotted white stripe; black discocellular and marginal dots; fringe with a slender basal line and the tips white; secondaries crossed just beyond the basal third by a second oblique white stripe, elbowed towards the costa; body greyish; under surface white, densely speckled with black; wings with the veins and costal borders slightly tinted with buff; the discocellular spots, a discal and marginal series of minute dots, black. Expanse of wings, 35 mm.

"Valparaiso, in December."—*T. E.*

Var. *seriata.*

Pinky brown (the female, however, with the basal three-fourths of primaries cream-coloured), speckled, mottled, and striated with dark grey; external area dark brown, with bronze reflections, the central blackish stripe indistinct in the female; the white stripes scarcely indicated, excepting by rows of black spots on the veins; body pale pinky brown; otherwise almost exactly as in the typical form. Expanse of wings, ♂ 34 mm.; ♀ 39 mm.

"Valparaiso, in December."—*T. E.*

Var. *melanosticta.*

Paler and greyer than the preceding, creamy whitish, excepting towards the base, outer borders, and the costal border of the primaries; the inner stripe of primaries dark brown, spotted with black; the broader central stripe varying in intensity, the outer stripe scarcely indicated, excepting by a row of black spots on the veins; a submarginal series of externally white-edged black spots, large towards the external angle, but gradually decreasing in size towards the apex; secondaries with five small black spots just beyond the discal line, towards anal angle; under surface as in the typical form. Expanse of wings, 34—39 mm.

"Valparaiso, in December."—*T. E.*

Var. *columba*.

Sericeous greyish brown, irrorated with blackish; secondaries slightly tinted with pale reddish cupreous; markings almost wholly obliterated, but the discal stripe represented by a series of black dots on the veins; sometimes three or four black spots beyond the latter, towards the anal angles of all the wings; under surface paler than in the typical form, the markings mostly obsolete. Expanse of wings, 35—36 mm.

Two females. "Valparaiso, in December."—*T. E.*

53. *Pharmacis ardescens*, n. s.

Primaries above dull red-brown; basal third and a broad costal border not reaching the apex white, tinted with pink near the costal margin; three nearly equidistant transverse blackish stripes, the first oblique, limiting the white basal third, the second straight, crossing the wing immediately beyond the cell (at the end of which is a black dot), the third oblique, running to apex, slightly incurved close to the inner margin, double, bounding the external border, which is suffused with blackish at apex and upon the median interspaces, and encloses a series of unequal black-centred ocelloid white spots; the innermost and outermost stripes are also mottled with black upon the veins; a series of black marginal dots; fringe grey; secondaries pale rosy cupreous, grey at the base and on the costal border, irrorated with grey, and crossed in the middle by a black-dotted grey stripe; a slightly undulated blackish discal stripe, close to which is a series of black dots upon the veins; this stripe is bounded outwardly by a subconfluent series of black-dotted white spots; a marginal series of black spots; fringe spotted with grey; body flesh-coloured, minutely and sparsely black-speckled; under surface white, irrorated with black; wings with disco-cellular dots and a continuous discal series black; marginal dots very indistinct; primaries crossed by a central grey stripe, touching which within the cell is a rather large diffused grey nebula; a trace of a grey stripe, answering to the third stripe of the upper surface. Expanse of wings, 36 mm.

"Valparaiso, in December."—*T. E.*

Although there is only one male of this insect in the collection, it appears to me to represent a perfectly distinct species.

54. *Pharmacis latifasciata*, n. s.

Above very pale brown, sericeous, irrorated with black; primaries with a subcostal white streak in the female; the central half of these wings crossed from inner margin to costal fourth by a broad black-brown belt, just within the margins of which are two narrow pale stripes, white in the male, and ferruginous in the female; two more or less defined subapical black dots; immediately beyond the belt is a series of white spots, tapering towards the apex, black-centred in the male, but not in the female; external area dark brown, clouded with blackish; a marginal series of black dots; fringe grey, sometimes with a pale basal line; secondaries with a black disco-cellular dot; a double dark brown discal stripe, bounded externally by a confluent series of spots scarcely paler than the ground colour, but black-centred in the male; snow-white in the female; a very slender black marginal line; under surface whity-brown, grey-speckled; small disco-cellular spots, discal and marginal series of dots, black; primaries showing a broad grey belt answering to that of the upper surface. Expanse of wings, 34—35 mm.

Both sexes occur of a slight variety resembling the typical male, excepting that the belt of primaries is not so black, the border of secondaries is a little darker, and the pale spots beyond the discal stripe are only black-centred throughout in the male. Expanse of wings, 32—34 mm.

Var. *definita*.

♀. Primaries above pale brownish grey, irrorated with blackish; the belt sharply defined, not enclosing the pale stripes, but bounded by them, only the outer one visible; three white-edged black spots near the external angle; subapical and marginal black dots as in the type; secondaries pale brown, irrorated with black; a simple undulated dark brown stripe, dotted with black upon the veins; two or three black dots beyond it, near the anal angle, and a marginal series; body whitish; under surface nearly as in the typical form. Expanse of wings, 36 mm.

"Valparaiso, in December."—*T. E.*

55. *Pharmacis insignis*, n. s.

♂. Allied to the preceding, but very distinct; above white, irrorated with brown; wings with bronze-brown external borders; primaries with brown costal border; central third occupied by an oblique black-brown belt, slightly constricted in the centre, extending from the inner margin to the costal fourth, but emitting a streak from its upper margin to the subcostal vein; two subapical black dots, and a marginal series; secondaries with the basal two-thirds pinky brown, traversed near its outer edge, and banded externally by two parallel dark brown stripes, the outer one dotted with black; a disco-cellular spot and a slender interrupted marginal line black; under surface shining sandy whitish, irrorated with grey; discal and marginal series of black dots, and black disco-cellular spots; primaries with a greyish central belt, limited externally by two convergent darker stripes. Expanse of wings, 37 mm.

"Valparaiso, in December."—*T. E.*

FIDONIIDÆ.

Tephrina, *Guenée*.

56. *Tephrina lapidea*, n. s.

Primaries above whity-brown, slightly tinted with pink in the female, indistinctly irrorated, and striated with greyish brown; primaries with a black disco-cellular spot, and crossed in the male by three equidistant lines, the first at basal third, angular, dark brown; the second central, nearly straight, pale golden-brown; the third discal, transverse, slightly sinuous, dark brown, and followed immediately by a series of blackish and fulvous unequal conical spots upon a diffused greyish streak; in the female there is only a broad irregular sinuous externo-discal grey-brown band, with reddish inner margin; the external border is also rather densely irrorated with the same colour; fringe brown, with a pale central line; secondaries whiter than the primaries, excepting towards the outer margin; crossed in the male by a slightly irregular discal series of five brown spots; under surface of the male whity-brown, of the female pale pinky brown or flesh-coloured; the wings sparsely irrorated with greyish and black-brown; small black

disco-cellular spots; primaries of the male greyish. Expanse of wings, 36 mm.

"From Reed's collection."—*T. E.*

57. *Tephrina varians*, n. s.

♂. Primaries above shining greyish brown, irrorated with whitish, crossed at basal third by an irregular whitish stripe with brown external margin, and on the disc by a wavy cream-coloured stripe, edged externally with dull reddish towards apex, and margined on both sides with brown; between these two stripes are indications of a transverse brown line; a whitish-edged black disco-cellular dot; secondaries pale sericeous greyish brown, almost white, irrorated (especially towards the abdominal margin) with dark brown; two or three dark brown spots towards the anal angle; body greyish brown; under surface sericeous whity brown, indistinctly grey-speckled; wings with small blackish disco-cellular spots between two scarcely visible parallel greyish brown stripes. Expanse of wings, 33 mm.

♀. Above of a pinker tint than the male; the markings much more defined; the inner stripe nearer to the base of primaries and more angular; the central line represented by a well-marked grey-brown stripe; the discal stripe with its outer two-thirds ferruginous, bordered externally by a broad diffused dark brownish streak; secondaries with three slightly divergent ill-defined abbreviated greyish lines from the abdominal margin to the median vein; body browner; under surface flesh-tinted, distinctly grey-speckled; central parallel grey-brown stripes well-defined. Expanse of wings, 34 mm.

"Cordilleras of Cauquenes, in January."—*T. E.*

The following, though placed with the succeeding species (if, indeed, it is really distinct, which seems to me a little doubtful), are certainly referable to *T. varians*.

A variety, in both sexes, much more densely irrorated with greyish brown throughout; the whitish speckling and the inner stripe on the primaries being almost wholly obliterated; the discal stripe flesh-coloured; fringe dark brown, with basal and central pale lines; the secondaries darker towards outer margin, with an

ill-defined blackish subanal spot; under surface shining grey in general appearance, owing to the denser grey speckling all over the wings; small black disco-cellular spots and faint traces of the two central stripes; there is no difference of pattern in the sexes, but the female is much smaller than the male and rather darker. Expanse of wings, ♂ 34 mm.; ♀ 26 mm.

In this form the discal stripe is sometimes widened in the male into a rather broad and internally diffused band, thus forming a connecting link with the next variety, in which the primaries are reddish throughout, with the basal half and external area greyish, the brown lines across the wings being quite distinct, more so even than in the typical form; the inner pale stripe, however, is lost in the general tint of the wing, only its brown outer edging being left; the male has the outer stripe bordered externally by a broad blackish wavy band. Expanse of wings, ♂ and ♀ 29 mm.

In other respects this variety agrees with the preceding one.

Var. *conigera*.

Wings pale greyish brown, with slight cupreous reflections irrorated with black; the primaries have a conspicuous black disco-cellular spot; the lines and stripes are all ill-defined, the discal reddish stripe diffused, and bounded externally by a series of blackish-edged conical spots (somewhat as in the male of *T. lapidea*); the secondaries are slightly darker towards the outer margin, and there are one or two subanal spots; below the primaries are distinctly greyish brown, and the central stripes are obsolete; otherwise the wings are like those of the preceding form. Expanse of wings, ♂ 32 mm.; ♀ 27 mm.

It is possible that this form may prove to be distinct; like the others it was taken at Valparaiso, some time between March and July; in some respects it forms a transition to the following species, though, as already hinted, they may *all* prove to be variations of one very inconstant type.

58. *Tephrina canescens*, n. s.

Greyish white, rather sparsely irrorated with black; primaries above crossed by five blackish undulated lines, the two first and two last closely approximated and representing the margins of the pale stripes in *T. varians*; the outermost line bounded externally by a series of conical black spots, which, in some examples (usually females) which have the external area also blackish or greyish, are seen to be white-tipped; an oblique black or blackish apical dash; a marginal series of black spots; fringe grey, with basal and central white lines; secondaries with faint indications of a stripe across the basal third; three subanal spots and a marginal series black; fringe as in primaries; abdomen greyish; primaries below shining grey, with the costal border and external area whitish, black-speckled; two or three black subapical spots; secondaries white, with grey external area, sparsely black-speckled; all the wings with black disco-cellular spots placed between two slightly arched brownish stripes; body white, legs grey-speckled. Expanse of wings, ♂ 33 mm.; ♀ 29 mm.

"Valparaiso, March to end of July."—*T. E.*

A male variety occurs in which the whole central area of the primaries, enclosed between the two pairs (subbasal and discal) of black lines, is blackish. Expanse of wings, 33 mm.

All the Chilian species have the antennæ rather broadly pectinated for the genus, though not much more so than in *T. arenacearia*.

Psamatodes, *Guenée*.

59. *Psamatodes ferruginaria*. (Pl. XVI., fig. 7).

Acidalia ferruginaria, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 96, n. 2; pl. 7, fig. 11 (1852-4).

"Valparaiso, in December."—*T. E.*

This species varies in depth of colour and in the distinctness of its markings, most specimens being paler than in M. Blanchard's figure. It is allied to *P. pumicaria*, so far as I can judge from M. Guenée's figure of that insect.

60. *Psamatodes chilenaria.* (Pl. XVI., fig. 6).

Acidalia chilenaria, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 95, n. 1 (1852-4).

"Valparaiso, September to January."—*T. E.*

This species, excepting in its strongly pectinated antennæ, bears considerable resemblance to some species of *Idæa* (*Acidalia*, auct.): it is a common insect.

61. *Psamatodes cauquenensis*, n. s.

Larger than either of the preceding species; shining pale whity brown; the primaries above dusted with white, crossed obliquely by three slightly sinuous and crenulated brownish stripes, the two last of which are rather near together; the outermost dotted with black upon the veins; a black spot at the end of the cell, and a marginal series of small black dots; secondaries with the external area whitish in certain lights and bounded internally by a crenulated brownish stripe; a black disco-cellular dot and a marginal series of minute black points; under surface with indications of the externo-discal stripe on all the wings, dotted with dark brown upon the veins; black disco-cellular spots and marginal dots. Expanse of wings, 36 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

I found a single unset male of this very distinct species in the collection.

Liodes, *Guenée.*

62. *Liodes venata*, n. s.

Nearest to *L. leucaniata* (*Chlenias vittuligera*, Wlk.),* from Australia, but with more nearly the coloration of *Lozogramma*; upper surface of primaries shining pale chocolate, black-speckled, with the veins and a number of longitudinal streaks between them cream-coloured, a black spot at the end of the cell, and a marginal series; fringe cream-coloured, shining, traversed by a chocolate-

* It is, I think, rather doubtful whether this species is congeneric with *L. tibiaria*; it certainly is not with *L. stilbiata* (*Panagra plusiata*, Wlk.), which agrees in structure with *Dichromodes*, Guenée, as do several species referred to *Panagra*.

brown line; secondaries paler than the primaries, almost cream-coloured, but with a chocolate tint; a more or less defined black spot or dot at the end of the cell and two or three black marginal points; primaries below pale chocolate-brown, sericeous, the borders more or less irrorated with cream-colour, particularly upon the veins; a black dot at the end of the cell; secondaries creamy yellowish, sparsely sprinkled with black atoms; a discal arched series of black spots on the veins, and a black spot at the end of the cell; body creamy yellowish. Expanse of wings, 33—34 mm.

"Chiloë, from Reed's collection."—*T. E.*

LOZOGRAMMA, *Stephens.*

63. *Lozogramma ceres*, n. s.

Primaries above pale shining stramineous, irrorated with black, and with a well-defined black disco-cellular spot; a marginal series of black dots; two oblique discal brownish stripes, slightly converging towards apex, the outer one abbreviated; these streaks are always indistinct, and sometimes wholly wanting in the female; secondaries sericeous-white, more or less tinted with stramineous at apex; fringe of all the wings traversed by a central leaden grey line; body varying from testaceous to pale stramineous; primaries of the male below brownish grey, sericeous, with the disco-cellulars dusky; fringe as above; secondaries pale stramineous, grey-speckled, and with dusky disco-cellulars; fringe as above; female below with the wings sericeous cream-coloured, sparsely grey-speckled, the primaries with a brown disco-cellular dot; body as above. Expanse of wings, 34 mm.

"Valparaiso, in February and March."—*T. E.*

Nearest to *L. petraria*.

64. *Lozogramma butyrosa*, n. s.

♂. General aspect of *Aspilates gilvaria*, but with the simple antennæ of typical *Lozogramma*; primaries clear creamy stramineous; a few minute blackish scales scattered here and there over the surface, and a black dot at the end of the cell; a scarcely perceptible abbreviated oblique stripe, a little deeper in tint than the ground

colour: secondaries sericeous creamy white; body pale stramineous; under surface pale creamy stramineous, shining; primaries with the discoidal area up to the centre of the disc flesh-coloured, slightly greyish in certain lights; a few blackish scales at the end of the cell; secondaries with a small black disco-cellular spot; internal borders of all the wings whitish. Expanse of wings, 39 mm.

"From Reed's collection."—*T. E.*

The absence of defined markings upon the wings gives this insect the aspect of *Neritodes* rather than *Lozogramma*; the primaries are, however, too large for that genus.

PANAGRA, *Guenée*.

65. *Panagra cavi-fasciata*. n. s.

♂. Primaries above with the basi-costal half sordid cream-colour, grey-speckled, bounded beyond the cell by an oblique abbreviated bisinuated white line; disc and internal area bronze-brown; an indistinct pale oblique undulated discal line half-way between the white bisinuated line and the outer margin; external area minutely irrorated with black; a marginal series of black spots; fringe cream-coloured, traversed by a grey line; a black spot at the end of the cell; secondaries pale greyish brown, whitish towards the costa; fringe cream-coloured; body grey; primaries below sericeous greyish brown, fringe as above; secondaries cream-coloured, irrorated with grey, most densely towards the outer margin; a black disco-cellular spot; fringe traversed by a grey line; body sordid cream-coloured, tibiæ greyish. Expanse of wings, 34 mm.

"Corral, in February."—*T. E.*

With this species the following was associated; but, as it differs entirely in pattern on both surfaces, I cannot for a moment believe it to be conspecific.

66. *Panagra signistriata*, n. s.

♂, ♀. Primaries above cream-coloured, sparsely irrorated with black; a short oblique costal litura at basal fourth and a slender oblique almost Ɛ-shaped character (not visible in the male example) at apical fourth of costal area; from the latter to the median

vein, just below the basi-costal litura, runs an oblique tapering and somewhat arched series of black-brown dashes, only separated from each other by the cream-coloured veins; a marginal series of black spots; secondaries paler than the primaries, indistinctly grey-speckled, with a marginal series of black dots; body sordid cream-coloured; wings below pale stramineous, changing to cream-colour towards the inner borders; grey-speckled, with black disco-cellular dots, and an arched discal series of spots, grey on the primaries and blackish on the secondaries, though less distinct in the male than in the female; fringe traversed by a slender grey line; body as above. Expanse of wings, ♂ 30 mm.; ♀ 35 mm.

"Corral, in February."—*T. E.*

SELIDOSEMA, *Hübner.*

67. *Selidosema phasma*, n. s.

♂. Shining grey; primaries crossed by an irregularly zigzag darker discal streak, diffused internally; costa blackish speckled, the remainder of the surface irrorated with dark grey; a slender interrupted marginal blackish line; fringe with faint bronze-brown reflections, traversed by a central slender white line; secondaries irrorated with dark grey towards the outer margin; fringe as in primaries; wings below with black disco-cellular dots; primaries with no discal streak; costa whity brown, black-speckled, rest of the surface uniform shining grey; fringe as above; secondaries paler, silver-grey, irrorated with blackish scales; fringe as above; body slightly brownish. Expanse of wings, 45 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

I am not acquainted with any species allied to this; it more nearly approaches *S. jaturnaria* than anything else that I have seen.

FIDONIA, *Treitschke.*

68. *Fidonia edmondsii*, n. s.

Primaries above pale olivaceous-brown, crossed by alternate bands of ash-grey and chocolate-brown as follows: base grey, speckled with chocolate, and bounded

by an angulated line of the same colour; an angulated grey band crossing the wing before the middle, and edged on both sides at costa with chocolate, but not below the costal border; a slightly irregular post-median chocolate band; a discal grey band, partly edged with chocolate, and dividing a large apical triangular patch of that colour; three creamy white spots on the costa between the bands; fringe dark purplish grey; secondaries bright orange-red; basi-abdominal area sprinkled with grey scales; abdominal fringe greyish; fringe towards anal angle blackish; body blackish, irrorated with pale brown scales; primaries below bright orange-red; costal border purplish brown, spotted at regular intervals with pale yellow; a broad purplish-brown apical patch; fringe dark shining slaty grey; secondaries pale yellow washed with pink, densely speckled with purplish brown; a disco-cellular spot, an irregularly sinuated discal line, and broad sinuated external border of the same colour; fringe slaty grey, varied (especially in the centre) with reddish orange; body pale sulphur-yellow, densely irrorated with grey. Expanse of wings, 22—22½ mm.

"Valparaiso, in August; flies by day."—*T. E.*

The female has more yellow than the male in the ground colour of the primaries above, and more red in that of the secondaries below.

There are two varieties of the species, one in which the grey bands of the primaries are replaced by flesh-pink in the female, and almost obliterated by chocolate-coloured scales in the male; the other, in which the entire insect is much smaller, and the post-median chocolate band is narrower; it measures 18—20 mm. in expanse.

Ochyria, *Packard.*

69. *Ochyria ignipennis*, n. s.

Allied to *O. rubrosuffusata*; primaries above dark reddish brown, crossed by numerous undulated blackish lines, with a narrow subbasal band, a broad angular central belt, and a tapering discal band, dark brown, limited by black lines, and partly edged externally by cream-coloured undulated lines; four white-centred submarginal black spots; a black marginal line interrupted by the veins, and followed by a slender white line at the

base of the fringe; secondaries fiery cupreous, with brown fringe; body brown; primaries below cupreous-orange, with brown costal and external borders, upon which are traces of the cream-coloured undulated lines of the upper surface; secondaries cupreous-brown, with a darker slender angulated discal line and disco-cellular spot; fringe darker brown; body brown. Expanse of wings, 24 mm.

"Corral, in February."—*T. E.*

Somewhat like *Fidonia scarata* of Felder, but without the pectinated antennæ.

SPARTOPTERYX, *Guenée.*

70. *Spartopteryx? denticulata*, n. s.

Somewhat resembles *Caripeta* in the pattern of the primaries; the margin slightly subangulated below apex, owing to the prominence of the third undulation (at extremity of upper radial); otherwise there appears to be nothing to separate it from typical *Spartopteryx*; primaries sericeous-whitish, with whity-brown costal border and veins, the whole surface speckled and striated with blackish, and clouded with grey; two very irregular black lines indicating the central belt, which is formed much like that of *Caripeta divisata* (see Packard's 'Monograph,' pl. ix., fig. 51); the outer line edged with white; a slightly sinuous submarginal white-edged black line; a marginal series of black spots and a conspicuous black disco-cellular spot; secondaries ashy whitish, washed with pale bronze-brown, speckled with dark brown, and crossed by two grey lines, the inner one, which crosses the wing just beyond the middle, more distinct than the other, and irregularly zigzag; a marginal series of black spots; thorax greyish, black-speckled; abdomen pale bronzy brown; under surface silvery white, sparsely irrorated with black; with black disco-cellular spots and traces of two blackish and dark brown undulated discal lines; primaries with a black spot at basal third of costal border, which (as well as the veins) is whity-brown as above; posterior femora and tibiæ barred with black near the knee. Expanse of wings, 39 mm.

"Las Zorras, in February."—*T. E.*

Apparently tolerably common ; it varies somewhat in the colour of the primaries, owing to the greater or less density of the black speckling upon these wings ; in some examples (chiefly females) the general colour of the primaries, seen without a lens, is sericeous-blackish grey.

ASPILATES, *Treitschke.*

71. *Aspilates lacticinia*, n. s.

Primaries above pale creamy stramineous, irrorated with greyish brown ; an oblique pale brown stripe from apex to just beyond the middle of the submedian vein, and a small spot of the same colour at the end of the cell ; secondaries shining white, with cream-coloured fringe ; two or three subapical grey dots ; body cream-coloured ; wings below shining white, costal borders cream-coloured, grey-speckled ; primaries with disco-cellular spot and oblique stripe rather greyer than above ; pectus creamy stramineous ; venter white. Expanse of wings, 28 mm.

"Valparaiso, in November and December."—*T. E.*

A variety of this species occurs in which the primaries are more densely speckled than in the type, and the oblique stripe is recurved towards the costa at its inferior extremity, thus forming an unequal V-shaped character, the outer branch being nearly twice the length of the inner.

The following, included with *A. lacticinia*, appears to me to be referable to an allied but distinct species :—

72. *Aspilates birittata*, n. s.

Primaries stramineous, mottled and speckled with grey ; crossed by two widely separated pale greyish brown stripes, converging at inner margin, and, in the male, dotted with black upon the veins ; secondaries white, the abdominal border in the male sprinkled with dark grey scales ; an arched discal series of black dots, replaced in the female by a short arched grey stripe ; fringe stramineous ; a black disco-cellular dot ; body of the male sordid stramineous, of the female whitish primaries of the male below white, shining, densely

blotched with grey; the costal border and fringe golden stramineous; a well-defined blackish disco-cellular spot, and dark grey oblique discal stripe; secondaries stramineous, whitish at abdominal border, irrorated with dark grey scales; a spot at the end of the cell, and an arched discal series upon a slender dusky line, black; body stramineous; female below with the wings shining white, sparsely irrorated with grey and blackish, the costal areas slightly tinted with stramineous; well-defined, though small, blackish disco-cellular spots; primaries crossed by two grey stripes, corresponding with those of the upper surface; body whitish, legs stramineous. Expanse of wings, ♂ 26 mm.; ♀ 31 mm.

Valparaiso.

There is also a variety in which the two stripes across the wings converge much less at inner margin, and the discal dots or stripe on the secondaries are less distinct or obliterated; I hardly think this can be a different species.

PSEUDOSESTRA, n. g.

Closely allied to *Sestra*, of Walker, from New Zealand, but differing in having the outer margin of the primaries rounded, with scarcely a trace of angulation at the extremity of the third median branch, and with no trace of sinuation between the latter and the apex; secondaries apparently with the costal margin longer. Type, *P. obtusata* (*Lozogramma obtusata*, Walk., from New Zealand).

I believe that my "*Ozola*" *terranea*, from Japan, will have to be referred to this genus, but at present I only know the female; the male may have pectinated antennæ.

73. *Pseudosestra bella*, n. s.

Primaries pale pinky brown, clouded with sienna beyond the middle, sparsely but rather conspicuously black-speckled, lilacine-grey at apex; fringe rust-red; a short oblique abbreviated blackish line across the costal area, just before the middle, and an oblique subangulated and slightly curved grey stripe across the disc; two small submarginal black spots near the apex; secondaries sericeous snow-white; the fringe slightly tinted with pink towards the anal angle, a biangulated greyish brown line across the disc in the female; body cream-coloured; head and collar flesh-coloured; male below

with the primaries lilacine-greyish, the secondaries and body white; female with the whole under surface shining white; the primaries with blackish-speckled costal border, three black marginal dots (there are four in the male), and red-brown fringe; secondaries sparsely but distinctly black-speckled, more so than in the male, where the speckling is greyer; both sexes with an angulated blackish discal stripe across the primaries; the secondaries with a sinuous black-spotted brownish discal line, a black disco-cellular spot, and three or four marginal spots; anterior legs greyish brown above. Expanse of wings, ♂ 28 mm.; ♀ 31 mm.

"Valparaiso, in November and December."—*T. E.*

As I believe I have stated elsewhere, I do not feel at all satisfied that *Sestra*, *Ozola*, and allies belong to this family; I believe they have greater affinity to some of the *Ennomidæ*; the present location of *Pseudosestra* must therefore be considered provisional.

Of the *Zerenidæ* there seem to be no Chilian representatives; at any rate I have seen none; there is indeed a genus which Felder and Rogenhofer, for some incomprehensible reason, have referred to *Scotopteryx*, and which in shape bears some resemblance to Walker's two genera (which are structurally identical) *Narthecusa* and *Negla*; and not only are the latter out of place in the *Zerenidæ*,* but the character of the markings in the Chilian genus and its cephalic structure prove it to be nearly allied to *Scotosia*.

LIGIIDÆ.

The species which follow, referred by Felder and Rogenhofer to *Alsophila* of Hübner, are none of them congeneric with *A. æscularia* (the type of the genus *Alsophila*), and are not all referable to the same family.

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* This fact prevented my identifying them with drawings sent me some time since by my excellent correspondent, H. Dewitz, and thus induced him to redescribe one of them, *Negla perplexata* as *Endropia packardii*; the three species, *E. nachtigalii*, *tenuiorata*, and *perplexata*, are not true *Endropias*, and must be placed in *Narthecusa*; they have the antennæ of *Ereuxa*.

Chlenias, *Guenée.*

74. *Chlenias madidata?*

♀ *Alsophila madidata*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxii., fig. 27 (1875).

♂, ♀. "Las Zorras; December, January, and February."—*T. E.*

If, as I believe, I have correctly identified this species, Felder's figure is not characteristic; for though the form of the wings and the outlines of the broad belt across the primaries are the same as in Mr. Edmonds' specimens, the irregular submarginal white stripe is different, being confined in both sexes to the external angle, and bordered internally by a blackish spot; towards the apex there are several elliptical black spots, sometimes edged with white, but no trace of a continuation of the submarginal stripe, which must, I think, have originated in a much worn example restored by an imaginative artist; the male has plumose antennæ, as in other species of *Chlenias*; the primaries are occasionally tinted here and there with greenish.

Bacillogaster, *Blanchard.*

M. Blanchard has referred his genus to the *Crambites*, but gives no reason whatever for doing so; on the contrary, he says,—"Este género differe mucho de todos los demas Crambidas por lo largo de su abdomen y la forma de los palpos y de las alas." The figure is of the usual type of all in Gay's work, and cannot be depended upon; the secondaries are represented so small that the insect might pass for a species of *Pachrophylla*, Blanchard; whereas the diagnosis merely says "*posticæ oblongæ*," and the description, "Alas posteriores oblongas, pequeñas" (posterior wings oblong, small, or narrow); in the insects which I believe to be referable to *Bacillogaster* there is nothing remarkably small in the secondaries, but, as I have been unable to recognise the typical species, it is possible that it may have these wings smaller than its congeners.

75. *Bacillogaster boreas*, n. s.

Primaries reddish clay-coloured, with a broad longitudinal interno-median whitish streak; mottled all over

with black so as to give it a grey appearance, crossed at basal third by a very deeply indented slender zigzag black line, across which runs a slightly arched oblique white stripe, bounded internally upon the costa by a large black spot, but only seen in fresh male examples, as is the case with the other white stripes on these wings; an indistinct deeply dentate zigzag line just beyond the cell, crossed in the male by a slightly inarched white stripe, upon which is a series of black dots; a conspicuous rounded black disco-cellular spot; an internally blackish-bordered oblique abbreviated white stripe on the disc from the external angle; a marginal series of black dots, forming towards the external angle a broken line; secondaries white, the female with flesh-tinted external area, and an imperfect slender blackish line; body of male testaceous, the abdomen greyish in the centre, with black dorsal tufts; in the female, the primaries of which are of a more laky tint than in the male with the costal border distinctly grey, the body is also distinctly of a pinker colour, with greyish tegulæ; primaries below whity-brown, sericeous, greyish in certain lights, with a rather broad external dusky border, crossed by pale veins; a marginal black line, interrupted upon the veins; fringe dark grey, sericeous; costal margin black-speckled; a black spot at the end of the cell; secondaries sericeous-white; costal area slightly speckled with brown; a black marginal line as in the primaries; fringe white; body below pale brown. Expanse of wings, ♂ 33 mm.; ♀ 39 mm.

"Valparaiso, November and December."

"Larva smooth, and purplish red in colour; exactly resembles the stem of the food-plant; feeds on Quilo in October."—*T. E.*

76. *Bacillogaster parva*, n. s.

Primaries above bronze-brown, sericeous, black-speckled; the discoidal area and costal border more or less mottled with white; two parallel arched bands beyond the middle; the inner one blackish, the outer one commencing in a chalky white apical streak, its centre more or less distinct, pale reddish brown, sometimes obsolete, its inferior extremity (which almost reaches the external angle) blackish, with white external

border; a black marginal line; fringe grey, with a white basal line; secondaries pale bronze-brown, usually almost white, with black marginal line; fringe paler than in the primaries; body pale brown; wings below shining whity brown, slightly greyish in the typical male; secondaries with a rather large dusky disco-cellular spot; pectus whitish; venter greyish or brown. Expanse of wings, 27—29 mm.

"Valparaiso, November and December."

"Larva twig-like; feeds on *Adesmia*."—*T. E.*

77. *Bacillogaster hypparia*

♀ *Alsophila hypparia*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxii., fig. 35 (1875).

"Valparaiso, in December."—*T. E.*

Felder's figure is not a very characteristic one, the markings being too strongly defined; the wings rather too broad, and with more sinuous margins than exist in any of the examples before me; the male doubtless has a longer body.

LARENTIIDÆ.

OPORABIA, *Stephens*.

78. *Oporabia cymatophora?*

♀ *Alsophila cymatophora*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxii., fig. 26 (1875).

"Baths of Chillan, in March."—*T. E.*

In Felder's figure the markings are too strongly defined, unless I have mistaken the species, and there is no trace of even a slight subangulation of the primaries in Mr. Edmonds' examples; excepting in their slightly smaller secondaries, they look like pale greyish examples of *O. filigrammaria*.

79. *Oporabia martha*, n. s.

Primaries above pale bluish grey; basal half crossed by two pairs of black-brown lines, the inner pair <-shaped, the outer irregularly undulated; a third pair of lines wider apart and lunulated beyond the middle; the area enclosed by these last lines is brownish, and traced by an indistinct grey line; an arched discal series

of slender >-shaped black markings terminating near external angle in a ≤-shaped spot filled in with blackish; an interrupted cruciform brownish costal patch beyond this series of markings; the whole surface of the wings between the other markings crossed by indistinct lunulate white-edged grey lines; a black lunulated marginal line; fringe whitish, traversed by two grey lines, the inner one dark; secondaries pale sericeous-grey, with a dark marginal line; thorax whitish; antennæ and abdomen reddish brown; primaries below with the costal half washed with laky brown; a darker lake-brown costal spot beyond the middle, bounded on each side by cream-colour; this spot, in certain lights, is seen to be the commencement of an arched greyish band, bounded externally by a band rather paler than the ground colour; internal half of wing greyish white; fringe nearly as above; secondaries sordid-white, slightly tinted with reddish towards outer margin; pectus white; legs lake-brown above, the tarsi banded with whitish; venter whitish. Expanse of wings, 26 mm.

"Las Zorras."—*T. E.*

A pretty little species, with nearly the pattern of *O. dilutata*.

80. *Oporabia hastigera*, n. s.

Primaries above pale brownish grey, crossed from the base to beyond the middle by irregular angulated blackish lines spotted with black on the veins, the fourth and fifth and the two last, which are in pairs, represent the limits of the central belt, are spotted with cupreous in the male and blood-red in the female, within the cell and between the radial veins; disc crossed by two series of hastate black spots, indistinctly united by lunulated grey lines, which are also reddish upon the radial interspaces; a marginal series of black dots; fringe white, spotted with dark grey; secondaries white, with cream-coloured fringe; thorax brown, black-speckled; abdomen sericeous whity brown; primaries below pale grey; apex and costal margin brownish; secondaries white; body below whitish; legs blackish, barred with white above, white below. Expanse of wings, 29—30 mm.

"Las Zorras, in January."—*T. E.*

LARENTIA, *Duponchel.*

81. *Larentia chillanensis*, n. s.

Size, coloration, and general appearance of *L. Kollariaria* of Europe, but the primaries with slight bronze reflections, the costal border conspicuously spotted throughout with black, and the bands spotted upon the veins with black; wings below with a bronze-brown reflection; the bands on primaries very indistinct. Expanse of wings, 41 mm.

"Baths of Chillan, in February."—*T. E.*

Probably allied to the so-called "*Eubolia*" *momaria* of Snellen.

HAMMAPTERA, *Herrich-Schäffer.*

The species of this genus, although referred by M. Guenée to *Cidaria*, and by Walker both to *Cidaria* and *Pterocypha*, are in reality intermediate in structure between *Larentia* and *Lobophora*, the females being extremely like *Larentia frustata* both in pattern, coloration, and structure, and the males like broad-winged *Lobophoræ*, the lobe being represented by a sort of inverted and folded pouch upon the surface of the abdominal area of the secondaries.

82. *Hammaptera chiloëna*, n. s.

♀. Upper surface extremely like *H. frondosata*, but the primaries of a distinctly yellower colour, the secondaries of a bronze-brown colour, with the usual pairs of pale-edged black marginal dots; an externally white-edged blackish spot near the anal angle; wings below pale brassy golden brown; primaries grey in certain lights, with paler veins; an abbreviated transverse pale band upon the disc beyond the cell, and through the centre of it an ill-defined slender dusky line; a submarginal series of whitish dots; a blackish disco-cellular litura; fringe white, spotted with brown, with golden reflections; central half of costal border cream-coloured; secondaries with a black spot on the upper disco-cellular; numerous angular indistinct brownish lines across the external two-thirds; a squamose greyish submarginal streak; fringe white, touched here and there with grey,

and with the usual golden reflections; body below cream-coloured. Expanse of wings, 37 mm.

"Chiloë, from Reed's collection."—*T. E.*

The pattern above is so like that of the species figured by Herrich-Schäffer that it would be worse than useless to describe it in detail.

Rhopalodes, *Guenée.*

The species which I refer to this genus has the same clubbed antennæ in the female, similarly small secondaries, upon which (as in the type of the genus) there are two indistinct submarginal stripes, but the subcostal (not the costal vein) has a free furca, and the inner margin of the primaries has two projecting scale patches similar to those of some of the *Notodontidæ*: were it not that I rather doubt the absolute accuracy of some of the characters given by Guenée, it would be necessary to erect a new genus for the Chilian species. There is no question of the affinity of *Rhopalodes* and *Lobophora*; it is out of place in Guenée's classification, as also is *Sauris*.

83. *Rhopalodes virescens.* (Pl. XVI., fig. 10).

♂, *Tomopteryx virescens*, Philippi, Stett. Ent. Zeit. xxxiv., p. 315, n. 3; pl. 2, fig. 7 (1873).

♀. "Chiloë, Reed's collection."—*T. E.*

The primaries of the female agree in pattern with those of the male, but the secondaries are extremely pale gold-brown, with two grey submarginal stripes; the characters of this sex prove that it is not congeneric with *T. amœna* (the type of the genus), and I strongly suspect *T. læta* to be a second Chilian *Rhopalodes*, and an extremely rubbed male from the Cauquenes (too much worn for description) to be a third; their primaries are too broad for either *Tomopteryx* or *Pachrophylla*.

Amathia, *Duponchel.*

This genus is constantly confounded with *Lobophora*, of which *L. polycommata* is type; the type of *Amathia* is *A. hexapterata*.

84. *Amathia lineolaria.*

♀, *Larentia lineolaria?*, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 95, n. 2 (1852-4).

"Las Zorras, November and December."—*T. E.*

Whether this really is Blanchard's species or not it is quite impossible to say; but, if not, I see no reason why it should not retain the name of *A. lineolaria*; it is not at all unlike a pale greyish and very large representative of *A. hexapterata*; the lines across the primaries are, however, all sharply defined in dark grey, touched here and there with black, and the secondaries are of a similar grey colour to the primaries; in fact the tint throughout the entire insect is singularly uniform, the wings being sericeous, with slight bronze reflections. Expanse of wings, ♂ 36 mm.; ♀ 38 mm.

85. *Amathia indistincta*, n. s.

♀. Pattern and coloration extremely like that of *Larentia aqueata* of Europe, but the secondaries considerably smaller; wings silvery white; the primaries above entirely covered by numerous parallel undulated dark greyish olivaceous slender lines, four of which appear to be better defined than the others, and represent subbasal, two median and submarginal stripes; when examined with a lens, however, these stripes are seen to be composed not of single continuous lines, but of parts of two or three lines in proximity, which are darkened; secondaries with two or three scarcely visible parallel grey submarginal lines; body whitish; under surface silvery white; the markings of the primaries visible through the wings in certain lights. Expanse of wings, 31 mm.

"Las Zorras, in February."—*T. E.*

This is a delicately coloured little species.

Haplopteryx, n. g.

Aspect of *Anaitis*; form of *Docirava*; allied to *Lobophora*; differs from all in the simple structure of the male secondaries, the discoidal cell of which is very small, only extending to the basal fourth; costal vein

incurved and parallel to the subcostal towards the base; subcostal forked, the branches upon a rather long footstalk; radial emitted near to the median, which is two-branched, and replaces both submedian and internal, which consequently are absent; palpi short; antennæ filiform, thicker in the male than in the female; body slender, scarcely extending beyond the secondaries.

86. *Haplopteryx anomala*, n. s.

Primaries dark shining grey, sprinkled with black and white scales, and with a slender transverse white dash at the end of the cell; upon the central band, which is whitish or buff in the female, but of the ground colour in the male; this band is very irregular, is much constricted in the middle, and is bounded on both sides by about five very irregular undulated and angulated more or less defined black lines, which occupy the central three-fifths of the wing-surface; beyond the cell these lines are zigzag, much as in *Scotosia certata*: two subbasal straight approximated black lines; a triangular costal apical patch of grey or buff; an internally blackish bordered regularly zigzag white submarginal line; external border dark, sometimes brown; a marginal series of black spots in pairs, sometimes united into a continuous line; fringe shining grey, traversed by a blackish stripe, and with a slender white basal line; secondaries whity brown or dark smoky grey, with a slender dusky marginal line; fringe traversed by a dusky stripe; body greyish or whity brown; under surface shining grey, more or less tinted with bronze-brown; secondaries of male whitish; an abbreviated dusky zigzag streak beyond the cell of primaries; the male also with the external border pale buff, with regularly zigzag inner edge. Expanse of wings, ♂ 41 mm.; ♀ 38—42 mm.

"Baths of Chillan, in March."—*T. E.*

Associated with the above was the male of the following species, which must form the type of a new genus:—

Hoplosauris, n. g.

Allied to *Tatosoma* of New Zealand; general aspect (excepting in the form and size of its posterior wings) of *Tomopteryx fissa* of Felder; primaries very broad and

triangular; secondaries of male small and oval, *not lobed*, with almost the same neuration as in the preceding genus; body very long and slender; head large, with long tapering simple antennæ; palpi small, projecting a little in front of the head; legs long and slender; hind tibiæ with two pairs of spurs, the inner ones long, the outer ones very short; palpi of female long and deflexed.

87. *Hoplosauris heliconoides*, n. s.

♂. Above silver-grey, crossed by darker lines formed much as in *Anaitis plagiata*, black-spotted upon the veins; a white disco-cellular spot; secondaries a little whiter than the primaries, without markings; body whitish; under surface greyish white. Expanse of wings, 38 mm.

♀. Very like *Oporabia dilutata*; the primaries a little whiter than in the male, with the lines across them rather more angular and undulated. Expanse of wings, 88 mm.

"♂, Baths of Chillan, in March; ♀, Corral, in February."—*T. E.*

88. *Hoplosauris ? alba*, n. s.

♀. Sordid-white; primaries with the aspect of *Bryoptera canitiata*, crossed by numerous crenulated lines, black upon the costal border, pale greyish green elsewhere, excepting upon the veins, where they are dotted with black; upon two parallel lines, which cross the disc, there are, however, two reddish patches, one crossed by the lower radial and the other by the first median branch; a red-brown dot at the end of the cell, and a red-brown spot attached to a short black dash on the interno-median interspace uniting the lines, which represent the central belt and which are here much contracted; a marginal series of black dots in pairs; an oblique slender black dash at base of internal border; secondaries with the external border slightly greyish, tinted with pink; primaries below rose-coloured; costal margin cream-coloured; internal area whitish; a slender black line along the outer margin; fringe white; secondaries white, with rosy-tinted costal area; a dusky disco-cellular lunule; body below white; palpi and legs banded with black. Expanse of wings, 88 mm.

"Valdivia, in February."—*T. E.*

This and the following (which was associated with it) differ from the typical female in the neuration of the secondaries; the second and third median branches being emitted, like the subcostal branches, from a fairly long footstalk: as, however, the males are unknown to me, I hesitate to make a distinct genus for their reception, since it is possible that the males may be found to belong to some group already separated.

89. *Hoplosauris ? mœsta*, n. s.

Shining dull silvery grey, with slight brownish reflections; primaries with the central area slightly greenish, crossed by blackish lines representing the central belt, and formed much as in the preceding species, changing abruptly to chocolate in and beyond the cell and in the interno-median interspace, where the ground colour is slightly tinted with pink; the other lines are all obsolete, excepting towards the costal border and at inner margin (though it is possible that they might be visible throughout in perfectly fresh examples); a discal series of elongated black spots or dashes; external border tinted with rose-brown; a marginal series of black spots in pairs, connected by a submarginal series of small lunate black markings; fringe whitish, slightly rosy at base, and traversed by a series of dusky dots; secondaries with white fringe; primaries below slightly rosy towards apex; a slender black marginal line; fringe white; body below pale golden brown; palpi dark brown; tibiæ and tarsi banded with black. Expanse of wings, 38 mm.

"Valdivia, in February."—*T. E.*

Pachrophylla, *Blanchard.*

90. *Pachrophylla varians*, n. s.

♂. Shining creamy white; primaries crossed in the middle by a pale grey belt, narrow towards inner margin; constricted, and dotted with ferruginous upon the interno-median area, abruptly expanded above the median vein, and separating into two bands towards the costa; this belt is margined and traversed by zigzag darker grey lines dotted with black; an externo-discal series of acute black dashes with pure white centres, and a marginal

series of black dots in pairs; basal area traversed by broken fragments of several parallel undulated lines, black-spotted on the veins; secondaries without markings; under surface creamy white; primaries tinted with rose-red towards apex. Expanse of wings, 28 mm.

♀. Altogether darker and greyer than the male; primaries varying from yellow to lilacine-grey; the central belt, a subbasal band, and the external area, which is represented by an irregularly cuneiform band, lilacine, traversed by chocolate-coloured lines and spots in place of the blackish ones of the male, the veins being white, barred with black throughout; secondaries more or less dark smoky grey; body greyish; under surface smoky grey, the costal and apical areas of primaries washed with lake-red, the apical area of secondaries slightly rosy towards apex; palpi and femora rosy; tibiæ and tarsi banded with blackish. Expanse of wings, 29—33 mm.

"Valdivia, in February."—*T. E.*

In the female of this species, which bears some resemblance to *Hoplosauris ? mœsta*, the palpi are shorter and less deflexed; and the second and third median branches of the secondaries, though emitted together from the inferior angle of the discoidal cell, are not placed upon a footstalk.

91. *Pachrophylla minor*, n. s.

♂. Much like a small broad-winged *P. obelata* or *P. linearia*, but the secondaries comparatively broader and larger; as in males of *P. linearia*, the wings are far more completely obscured by lines, and by the black bars upon all the veins, than in the under-coloured female represented by Blanchard, or even than the male variety figured by Felder*; the longitudinal black and white streak near the external angle of primaries is well defined. Expanse of wings, 29 mm.

No exact locality recorded.

This species was incorrectly labelled *P. linearia*, from which species, however, it was kept separate in the collection. It appears to be common, as there are no less than ten examples in Mr. Edmonds' boxes.

* The size of the secondaries in Felder's figure is exaggerated.

Var. *fasciata*.

♀. Differs from the typical form in having a well-defined dark central belt, which divides just above the median vein into two oblique bands slanting inwards; marginal black dots almost united into a continuous line; secondaries and body greyer. Expanse of wings, 27 mm.

"Las Zorras."—*T. E.*

I found a single example of this form in the collection associated with *Oporabia martha*.

Var. *fumosa*.

♂, ♀. Rather larger than the typical form; the primaries sericeous smoky brown, very dark, varied with flesh-colour, and crossed by black lines; the usual black and white streak near the external angle; primaries and body below also much darker grey than in the type. Expanse of wings, 30 mm.

Exact locality not recorded.

92. *Pachrophylla lineata*. (Pl. XVI., figs. 8, 9).

♀, *Pachrophylla lineata*, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 97, n. 1; pl. 7, fig. 9 (1852-4).

Var. ♂, *Pachrophylla obclata*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxii., fig. 36 (1875).

"Las Zorras, November and December."—*T. E.*

The female of the variety *P. obclata* has a well-defined angulated band across the primaries; faint outlines of this band occur in the under-coloured females typical of the species, but the artist has failed to indicate them in Blanchard's figure.

The following genus, although allied to *Pachrophylla*, differs in its angulated primaries and the larger lobes of the secondaries; the palpi also are not deflexed like those of *Pachrophylla*.

Tomopteryx, *Philippi.*

93. *Tomopteryx amœna.*

♂, *Tomopteryx amœna*, Philippi, Stett. Ent. Zeit., xxxiv., p. 313, n. 1; pl. 2, fig. 5 (1873).

♀, *Alsophila ternata*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxii., fig. 28 (1875).

"Las Zorras, in December."—*T. E.*

Hasodima, n. g.

Belongs to the *Lobophora* group of genera; primaries rather narrow, elongate-triangular, the outer margin very slightly oblique; second and third median branches emitted from a short footstalk; secondaries obtusely triangular; discoidal cell rather long, emitting the subcostal branches from one point at its anterior angle and the second and third median branches at its posterior angle; disco-cellulars semicircular; body rather slender and elongated, the antennæ long, slender, pectinated nearly to the tips; palpi porrect, extending for about half their length in front of the head; proboscis strong; thorax rather short; abdomen with large well-developed dorsal tufts; legs moderately long; posterior tibiæ compressed, tapering at the extremities, with two very small subterminal, and one terminal, spurs.

94. *Hasodima elegans*, n. s.

♂. Primaries above pale flesh-brown, varied with snow-white, and transversely densely striated with greyish olivaceous; an almost circular spot of this colour at the end of the cell; a slightly irregular oblique black line just beyond the basal third, and a sigmoidal line at external third, the latter bordered internally by an internally dusky-margined grey stripe, which expands into a triangular patch at inner margin; these two black lines represent the limits of the ordinary central belt; a marginal series of black spots; fringe olivaceous, with basal and subterminal white lines; secondaries sericeous-white; a few dark brown flecks towards outer margin, and a black marginal line; fringe pale grey, with a white basal stripe; body greyish olivaceous; under surface white; primaries with traces of the markings of the

upper surface ; disco-cellular and marginal spots black ; secondaries with a small black disco-cellular spot and slender imperfect marginal line ; anterior tibiæ and tarsi pale flesh-brown above, banded with blackish. Expanse of wings, 38 mm.

"Las Zorras, in January."—*T. E.*

EUPITHECIA, *Curtis.*

95. *Eupithecia œnone*, n. s.

Silvery white ; wings with a fairly wide, slightly interrupted dark grey external border, traversed by a white dentate-sinuate line, beyond which, on the primaries, the tint changes to yellowish olive ; a marginal series of linear black dashes ; primaries crossed from costal margin to median vein by five or six macular angulated brown stripes, indicating the central belt ; a conspicuous black spot at the end of the cell ; basal two-sevenths of costal border black, crossed by one or two white bars ; secondaries crossed by several parallel greyish undulated lines, one towards the base and two on the disc becoming black towards the abdominal margin ; body greyish ; wings below less distinctly marked than above, but with similar markings. Expanse of wings, 21 mm.

"Las Zorras, beginning of December."—*T. E.*

May be placed near to *E. centaureata.*

96. *Eupithecia frequens*, n. s.

Nearly allied to *E. tenuiata* of Europe, but more variable in size ; the primaries with larger black disco-cellular stigma and distinctly darker external border, divided by the usual crenulated white line ; the discal whitish stripe of the same form, but sometimes more sharply defined by dark margins ; secondaries with a small black disco-cellular dot. Expanse of wings, 17—19 mm.

"Valparaiso, in December ; Corral, in February."—*T. E.*

The smaller form is from Valparaiso, the larger from Corral ; the latter has an oblique discal series of black dots on the under surface of the secondaries, but otherwise I see nothing by which to distinguish it from

the smaller form; I have not, therefore, considered myself justified in following Mr. Edmonds in keeping them separate.

97. *Eupithecia rosalia*, n. s.

Size and general coloration of *E. satyrata* of Europe, but the lines across the primaries deeply waved in an irregular zigzag form, most evidently towards the middle of the wing; a regular discal series of brown dots; secondaries with all the lines more defined. Expanse of wings, 21 mm.

"Valdivia, from Reed's collection."—*T. E.*

98. *Eupithecia sibylla*, n. s.

Silvery grey; primaries darker than secondaries; markings in blackish grey (excepting the black disco-cellular stigma of primaries), very similar to those of *E. vermiculata* of Snellen (Tijd. v. Ent. xvii., pl. 6, fig. 1, 1874), excepting that the two more defined discal lines are deeply sinuated beyond the cell, almost falciform, and that the abdominal series of blackish lines on the secondaries are continued across the disc to costa; the borders of all the wings are also dark grey, the sub-marginal and marginal lines being thick and somewhat diffused; notwithstanding these differences and its inferior size *E. sibylla* must resemble *E. vermiculata* not a little. Expanse of wings, 21 mm.

"Valparaiso, in December."—*T. E.*

99. *Eupithecia usta*, n. s.

Allied to *E. togata*, but differing in colour, and with all the lines sharply defined and very slender; primaries sienna-red at base, a white costal dash bounded on both sides by blackish streaks; an oblique subbasal narrow sordid-white band enclosing a slender brown line; central belt sienna-red to the middle of the interno-median interspace, white below it, margined and traversed by darker red-brown lines; disco-cellular spot oblique, oblong, black, with narrow whitish edge; a white zigzag line bounding the outer edge of the central belt; external area sienna-red, traversed by a slender dark brown line, followed by a zigzag submarginal white line; an apical

patch and a series of internervular dashes black; secondaries sordid-white, traversed by slender brown lines, the discal and submarginal lines, which are dentate-sinuate, united upon the veins to black dots and dashes; all the wings with a marginal series of straight linear dashes, only separated by the veins; fringe white, spotted with red-brown; body pale brown; thorax greyish; abdomen with two dark brown bands; under surface pale cupreous, sericeous; all the wings with conspicuous black disco-cellular spots; lines and other markings less distinct than above; primaries with bronze-brown apical patch; no internervular dashes. Expanse of wings, 26 mm.

"From Reed's collection."—*T. E.*

The following species has pectinated antennæ, and therefore is referable to Guenée's New Zealand genus *Helastia* :—

HELASTIA, *Guenée.*

100. *Helastia corralensis*, n. s.

Leaden grey; wings crossed by numerous irregularly undulated parallel darker lines, blackish on the primaries, but indistinct on the secondaries; a black marginal line, interrupted by snow-white dots at the extremities of the nervures; fringe slightly brassy, traversed by a grey stripe; primaries with pale buff costal border, almost hidden by the blackish lines, excepting for a square spot just beyond the central belt, the outer limit of which is indicated below this spot by a band rather paler than the ground colour; basal area rose-red, with the usual black costal dots and subbasal lines; body brown; thorax evidently reddish in fresh examples; wings below leaden grey, the costal border unequally spotted with blackish and white; a black marginal line followed by a slender white line at the base of the fringe; a blackish disco-cellular spot; secondaries with all the lines macular; a black disco-cellular spot; margin and fringe as in primaries; pectus flesh-tinted; anterior legs above blackish, barred with white; venter leaden grey. Expanse of wings, 18 mm.

"Corral, in February."—*T. E.*

The following species has much perplexed me; it has the coloration of *Aleucis*, with more nearly the aspect of *Scodiona*, but in structure it agrees with *Cheimatobia*, to which genus I therefore refer it.

CHEIMATOBIA, *Stephens.*

101. *Cheimatobia aleucidia*, n. s.

Shining grey; the body, primaries, and fringe of secondaries with bronze-brown reflections; primaries completely covered by numerous parallel undulated dark grey lines, two of which in the middle of the wing are more defined than the others, and commence in blackish costal spots; a blackish disco-cellular spot; all the wings with a blackish marginal line; head, collar, and shoulders dark brown; under surface uniform leaden grey. Expanse of wings, 23 mm.

"Las Zorras, in January and February."—*T. E.*

THERA, *Stephens.*

102. *Thera confusa*, n. s.

♂. Allied to *T. variata*, but all the markings of the primaries somewhat obscured by black and grey mottling; the subbasal area (and not the central belt) darker than the rest of the wing, blackish, wider than in *T. variata*, so as to reduce the width of the anterior part of the belt and throw it further forward; the latter scarcely separable from the disc, excepting by a slender black line of the usual form; external area greyish; submarginal dentate-sinuate white line straighter, not increased towards the costa as in *T. variata*; secondaries rather broader, white, grey-speckled, and crossed from the basal third by three grey lines, the innermost regularly arched, and the two others irregularly undulated and indistinct; thorax greyish brown; abdomen whitish; primaries below grey; costal border whitish, speckled with dark grey; two indistinct dusky stripes, both more or less diffused, the first just beyond the basal third, indistinct; the second, which is angulated, across the disc; a small blackish disco-cellular spot; fringe white, spotted with black; secondaries white, grey-speckled, and crossed by two dark grey lines, the first at basal third curved, the second across the disc irregularly arched and undulated;

an indistinct grey submarginal streak; a black discocellular spot; body below greyish white. Expanse of wings, 25 mm.

♀. More like *T. simulata*; the primaries of a flesh-brown tint, with the central belt formed by the addition of the subbasal area to its width, the two together being darker than the rest of the wing, and only divided from one another by a black line. Expanse of wings, 22 mm.

"Las Zorras, in February and March."—*T. E.*

YPSIPETES, *Guenée.*

103. *Ypsipetes cinerea*, n. s.

Primaries bluish grey; a slender transverse black basal line; a broad central belt slightly darker than the ground colour, with angulated black margins, tapering slightly towards the inner margin, and enclosing three black spots from the costa to the inferior angle of the discoidal cell; veins spotted with black and whitish; three submarginal series of black-spotted dark grey stripes; fringe pale grey, traversed in the centre by a very slender white line, behind which it is spotted with black; secondaries snow-white, slightly sordid near the outer margin; body grey, the abdomen whitish; primaries below silvery grey; secondaries snow-white; body below cream-coloured. Expanse of wings, 26 mm.

"Mountains of the haçienda of Cauquenes."—*T. E.*

There was one unset example of this singular species in the collection.

104. *Ypsipetes pastoralis*, n. s.

Colours of *Y. elutata*; primaries sap-green; one or two dots and an undulated subbasal line black; three bands scarcely darker than the ground colour, margined and blotched with black, the central one edged externally by an undulated white line; an interrupted submarginal black line, along the inner edge of which are two or three small widely separated white spots; fringe spotted with black and grey; secondaries rosy brown, greyish in certain lights; external area greyish, traversed by a paler undulated submarginal stripe; a slender blackish marginal line; fringe golden yellow towards the base

and spotted with rose-colour; thorax sap-green, spotted with black; abdomen greyish, with the anal segment and a dorsal line fulvous; under surface greyish brown, with black-spotted, yellow-edged, rose-coloured borders; a blackish discal stripe and a slender angular post-median line limiting the basal area; black disco-cellular spots; body below whity brown. Expanse of wings, 25—31 mm.

"Chiloë, from Reed's collection."—*T. E.*

Odontothera, n. g.

Allied to *Thera* and *Ypsipetes*; body long and slender, like that of *Thera*; style of coloration like that of *Ypsipetes*; general structure of the latter genus, but the outer margins of the wings denticulated; the primaries also angulated at the extremity of the third median branch.

105. *Odontothera virescens*, n. s.

Allied to *O. rinodaria* (*Scotopteryx ? rinodaria*, Felder), but considerably smaller; primaries bright sap-green, striated, mottled and banded with black-brown; three narrow bands across the central area, the innermost at basal third, arched; the second central, transverse and inangulated at both extremities in the female, but ill-formed and forming the inner boundary of a large blackish patch with angular outer margin extending beyond the discal stripe in the male, so as to limit the external border; a black disco-cellular spot; discal stripe slightly arched, inangled towards costa, and enclosing a dentate-sinuate black line; a submarginal series of snow-white spots attached to black dots, and bordered externally with dark brown; a black marginal line; fringe yellowish at base and white externally, traversed by a dull green line, and spotted with brown; secondaries sericeous rosy whitish, speckled with grey; external and abdominal borders deeper rose-coloured; two more or less complete discal series of dark grey spots, white-edged externally towards the abdominal margin; a white-edged black dash at anal angle; a slender blackish marginal line; fringe white, traversed by a grey line, and spotted with ferruginous; thorax greenish, varied with red-brown, and spotted with blackish; abdomen

whitish or flesh-tinted, grey-speckled; antennæ above black, barred irregularly with white, below ferruginous; under surface whitish, clouded with flesh-colour; primaries with grey traces of the markings of the upper surface; costa mottled with black; fringe spotted with brown; secondaries whiter than above, grey-speckled, with a conspicuous black disco-cellular spot and a complete discal series; fringe as above; body flesh-coloured; both legs and body irregularly spotted with blackish. Expanse of wings, 32—33 mm.

"Corral and Los Ulmos, in February."—*T. E.*

The under surface of the wings somewhat reminds one of the *Macariidæ*.

106. *Odontothera debilis*, n. s.

♀. Whitish flesh-coloured, the secondaries whiter than the primaries; all the markings above similar in outline to those of the female *O. virescens*, but the stripes much more slender, of a pale reddish brown colour, both inner and outer stripes on the primaries enclosing dentate-sinuate black lines, only the outer stripe being almost obliterated; this line stands out sharply; a black disco-cellular spot; mottling of the wings greyish brown; fringe dull rose-coloured, with pale basal line; secondaries with the inner series of discal spots replaced by a pale brown stripe and the outer by a black-dotted undulated brown line, the anal dash by a longer, but still abbreviated, brown stripe; antennæ whitish, speckled with brown; under surface more uniformly fleshy white than above, grey-speckled; primaries with grey lines in place of those on the upper surface, but otherwise similar; secondaries with a black disco-cellular spot; an angular red-brown stripe just beyond the cell; a discal series of small black spots partly connected by a brown line and an ill-defined anal grey-brown stripe. Expanse of wings, 39 mm.

"Valdivia, from Reed's collection."—*T. E.*

Scordylia, *Guenée.*

107. *Scordylia vittata.*

Euclidia? vittata, Philippi, 'Linnæa Entomologica,' xiv., p. 295, n. 32 (1860).

Heterusia mesenata, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxx., fig. 26 (1875).

"Valparaiso, August and September; a day flier."—*T. E.*

It is possible that this may be the *Phalæna ceraria* of Molina ('Saggio sulla storia naturale del Chili,' p. 147, 1782), but the description, were it correct, is too short for positive identification; it is simply this, "B. elinguis, alis deflexis flavescentibus, fasciis nigris," nearly half of which, viz., "B. elinguis, alis deflexis," is not true of *Scordylia vittata.*

Anticlea, *Stephens.*

108. *Anticlea corticalis*, n. s.

Primaries above laky brown, with a slight cupreous gloss; three oblique equidistant black costal streaks or lines on the basal two-thirds, the central one extended to the median vein, the external one forming the commencement of a slender dentate-sinuate discal line, to the inner edge of which longitudinal black nervular dashes are attached, connecting it with an ill-defined undulated inner dark brown line; an externally pale-edged bronze-brown undulated submarginal band; a black subapical marginal spot, below which the veins are tipped with black; secondaries sericeous-grey, with brownish reflections; body greyish brown, sometimes tinted with pink; under surface uniform brownish grey. Expanse of wings, ♂ 23 mm.; ♀ 28 mm.

"Chiloë, from Reed's collection."—*T. E.*

Not nearly allied to any known species.

Coremia, *Guenée.*

The antennæ of the males in this genus are ciliated, and the palpi for the most part long, though their length varies in different species which, in other respects, seem to be nearly allied; it would at present be premature to

exclude such species as did not precisely answer to M. Guenée's somewhat vague definition, "*Palpes en bec aigu, ne dépassant pas la tête de plus d'une longueur*"; but the antennal structure, as rendered by him, is too elastic to enable any lepidopterist to decide what is a *Coremia*: it runs, "Antennes pubescentes, ciliées ou pectinées chez les ♂." I therefore would restrict the group to species with the antennæ "ciliated," by which term I understand M. Guenée to designate delicate pectination; if pubescence be admitted there is no reason for excluding such as have simple or filiform antennæ.

109. *Coremia decipiens*, n. s.

♀. Much like *C. infundibulata* of Guenée, from Brazil, Colombia, and Venezuela*; greyish fuliginous, rather pale; the undulated lines across the primaries blackish, but not well defined; an undulated white line limiting the external border, which is darker than the ground colour, a blackish apical patch; central belt tolerably wide, slightly narrowing towards the inner margin, and a little angulated at the median vein; darker than the ground colour, commencing upon the costal border in two unequal blackish spots, the inner one well-defined and triangular, the outer continuous with the external boundary line of the central belt, which is black and undulated; a third blackish spot within the cell just above the median vein and between its first two branches; a marginal series of black spots in pairs, followed by a slender pale buff line at the base of the fringe; fringe of secondaries also with a pale basal line; under surface greyish brown; wings sericeous, with darker irrorations; fringes with a pale basal line; secondaries with a dark brown disco-cellular spot; an undulated ill-defined discal line, spotted upon the veins with black. Expanse of wings, 28 mm.

"Pines valley, in December."—*T. E.*

It is possible, when we know the male of this species, that it may prove not to be a *Coremia*, but its resemblance to *C. infundibulata* seems to justify its being placed provisionally in that genus.

* A species in which the male antennæ are distinctly ciliated; it has been redescribed by Walker as *Melanippe productata*, *Cidaria remissata* and *C instipata*, showing how little M. Guenee's definition assisted him in determining its generic location.

CAMPTOGRAMMA, *Stephens.*

The antennæ of this genus are simple in both sexes; the palpi, as in *Coremia*, form a short beak in front of the head.

110. *Camptogramma plemyrata.*

Camptogramma plemyrata, Felder and Rogenhofer, Reise der Fregatte Novara, x., pl. cxxxii., fig. 15 (1875).

"February, March and April."—*T. E.*

This species is nearly allied to *C. fluviata* of Europe, but differs in the strongly-defined band across the primaries; it varies from laky ferruginous to testaceous in the ground colour of these wings.

111. *Camptogramma? dubia*, n. s.

Aspect of *Coremia*, but with simple antennæ in both sexes; dark greyish brown; primaries not unlike *Coremia ferrugata* in pattern, but much broader, and with the central belt extending, at its inferior extremity, almost to the external angle; this belt is of a dull clay-colour, traversed by black lines with a pale buff costal patch and a white spot at the end of the cell; it is bounded externally by a white stripe, traversed by a grey line, which is again followed by an interrupted dark grey band with imperfect white external edge; external border greyish, with an elliptical black subapical spot; a marginal series of small black spots in pairs; fringe of all the wings whitish, traversed by a dark brown stripe; under surface shining dark grey; an externally whitish-edged dusky band just beyond the middle in all the wings; a submarginal series of white dots; a marginal black line interrupted at the extremities of the nervures, and a white line at the base of the fringe. Expanse of wings, 21 mm.

"Valparaiso, in February."—*T. E.*

A pale variety occurs in which the dark grey postmedian band is very distinctly spotted with black along its outer border.

The front wings of this species are rather broad for *Camptogramma*, and the pattern is that of *Coremia*.

PHIBALAPTERYX, *Stephens*.

A genus very easily confounded with *Hemerophila*, but differing in the simple, or almost simple, antennæ of the males, whereas in *Hemerophila* they are distinctly pectinated.

112. *Phibalapteryx edna*, n. s.

♂. Almost exactly agrees in pattern with the "*Tephrosia*" *disperdita* of Walker from Sydney; upper surface shining greyish white or silver-grey; black-speckled; primaries crossed by two or three ill-defined and interrupted irregular oblique blackish lines; the last of these lines runs from the outer margin near apex to about the middle of the inner margin, is widely bisinuated, and its upper half forms a strongly-defined black stripe; external border slightly darker than the ground colour, and traversed by an undulated white-edged submarginal line; secondaries striated with dark grey to the middle, excepting upon the costal area, and traversed beyond the middle by a slightly irregular slender black line, followed by a dark grey line; border and submarginal line as in the primaries; primaries below sordid shining grey, black-speckled, with a black disco-cellular dot and slender marginal line; secondaries shining white, speckled with black to the middle; a slender dark grey marginal line. Expanse of wings, 38 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

113. *Phibalapteryx jacintha*, n. s.

Allied to *P. perfectata* of Sydney, which it resembles in size and in its pearl-grey colouring and blackish markings; the belt across the primaries is, however, very oblique, its outer edge being obtusely and widely zigzag, more like *P. anguligera* of New Zealand; the double discal line of secondaries is also more prominent, owing to the indistinctness of the other lines on these wings; all the wings have a small black disco-cellular spot and slender sinuated marginal line; under surface shining white, sparsely black-speckled, with black disco-cellular spots and marginal line as above, also a discal series of black dots on the veins; primaries with a faint brownish

tint; the fringes are broad, traversed by a grey line and spotted with blackish. Expanse of wings, 27 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

SCOTOSIA, *Stephens.*

114. *Scotosia exacta*, n. s.

Nearly allied to *S. dubitata*, with the same pattern, but the primaries distinctly greyer, with no trace of reddish in them, and the secondaries smaller, paler, and with more dentate-sinuate margin. Expanse of wings, 37—41 mm.

"Valparaiso, November and December."—*T. E.*

115. *Scotosia cauquenensis*, n. s.

Nearly allied to *S. sabaudiata* of Europe, with the same pattern in grey lines and bands upon a shining white ground with faint bronze reflections; all the wings perfectly uniform in tint. Expanse of wings, 43—47 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

CIDARIA, *Treitschke.*

116. *Cidaria emilia*, n. s.

Belongs to the *C. psittacata* group, but the primaries are white, with yellowish veins and blackish brown markings, nearly resembling those of *C. prunata* in form; the secondaries are dark greyish brown, with whity-brown fringe, traversed by a subconfluent series of dark grey spots; primaries below dark grey, with the white-bordered bands of the upper surface only visible on the costal area; fringe white, spotted with dark brown; secondaries white, flecked and banded with grey; fringe white, spotted with greyish brown; body below dark grey. Expanse of wings, 20—24 mm.

"Valparaiso, in February."—*T. E.*

117. *Cidaria misera*, n. s.

Allied to the preceding; pale greyish brown, with slight golden bronze reflections; a basal patch, an irregular central belt, much as in *C. suffumata*, and a

subapical costal spot on the primaries, all with denticulated outer edges bordered with white, and followed by slender zigzag lines, dark brown; fringes of all the wings with whity-brown basal line; under surface shining grey; primaries white, with white costal spots. Expanse of wings, 23 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

118. *Cidaria diana*, n. s.

Belongs to the *C. russata* group; primaries above, with the basal third pale greyish stone-colour, the central third (bounded on both sides by blackish-edged dentate-sinuate white lines) partly greyish and partly pale buff, the external third dark greyish brown, clouded with blackish, and marked near outer margin by a large ill-formed crescent, near external angle by an irregular spot, and between these spots and the costa by several dots, all snow-white; the whole surface of the wing strongly shot in certain lights with bronzy gold; a dentate-sinuate central brown line, followed by a paler and less perfect line of the same colour; secondaries pearl-grey; fringe bronze-brown, tipped with white; head and thorax cream-coloured; abdomen dark grey; below, the primaries are grey, cupreous at apex, and the secondaries white, with black disco-cellular dots, and a slender dentate-sinuate discal line; the primaries show the white submarginal spots of the upper surface, and upon the fringe is a series of cupreous-brown spots; secondaries with a submarginal series of blackish dots upon the veins, and another upon the fringe; body sordid-white; venter greyish. Expanse of wings, 29 mm.

Var. *cynthia*.

Larger, the primaries considerably darker, of a more uniform greyish brown colour, with the markings less defined, the white spots sometimes almost obsolete. Expanse of wings, 30—33 mm.

Var. *luna*.

Smaller, altogether greyer, the primaries with a conspicuous black disco-cellular spot. Expanse of wings, 25 mm.

The disco-cellular spot varies in size in this form, and the lunate spot is sometimes grey instead of white.

"Corral, in February."—*T. E.*

119. *Cidaria ceres*, n. s.

Creamy stramineous, the primaries a little deeper in colour than the secondaries, crossed by two widely separated paler bands (with darker central line) indicating the limits of the central belt; a feebly-indicated, slightly dusky, subapical costal stripe; two brownish spots on the costa at the commencement of the pale bands; a minute black disco-cellular point; secondaries crossed beyond the middle by a dusky line; anal angle slightly brownish; under side uniformly pale shining stramineous; all the wings with a small black disco-cellular spot, a pale brown angular stripe beyond the middle, and an interrupted externo-discal stripe of the same colour. Expanse of wings, 28 mm.

"Corral, in February."—*T. E.*

Synpelurga, n. g.

Allied to *Pelurga* and *Dineurodes*, but with short slender ciliated antennæ in the male.

120. *Synpelurga corralensis*, n. s.

General pattern and coloration of *Cidaria suffumata*; creamy white, sericeous; primaries slightly brassy, with dark brown markings as follows: a subbasal spot followed by three ill-defined stripes, the two last somewhat approximated; central belt broad and angulated, traversed by a cream-coloured streak (upon which is a black disco-cellular spot), and immediately followed by a parallel angulated line and angulated submarginal and a marginal stripe, both wide towards apex, where they are divided by an oblique cream-coloured line, but tapering towards the inner margin; secondaries with an ill-defined pale grey central line, followed beyond the cell by a better-defined arched and undulated grey line; a submarginal, scarcely perceptible, pale grey band; under surface greyish; the markings of the upper surface ill-defined, and more or less suffused with rose-reddish. Expanse of wings, 36 mm.

"Corral, in February."—*T. E.*

Scotocoremia, n. g.

Allied to *Cidaria*, with the aspect of a large *Coremia* coloration of typical *Scotosia*; antennæ short, rather thick, tapering and rather strongly ciliated in the male; its larger secondaries, the straighter outer margin of its primaries, shorter and stouter abdomen, and style of coloration will at once distinguish it from the preceding genus.

121. *Scotocoremia obscura*, n. s.

Pattern of *Larentia frustrata* of Europe, than which, however, it is larger; coloration of *Scotosia dubitata* greyish, the primaries with a slight pinky gloss, the markings dark grey-brown edged with black; the under surface is like that of a *Hammaptera*, the primaries grey, with a white angular stripe indicating the outer border of the central belt, with a submarginal row of white spots and a small black disco-cellular dot; the secondaries greyish white, with black disco-cellular spot; three angular grey lines just beyond the middle, and an ill-defined submarginal line. Expanse of wings, 36 mm.

"Las Zorras, in January."—*T. E.*

Psaliodes, *Guenée*.

122. *Psaliodes signata*, n. s.

Primaries above whity-brown, sericeous, traversed by several undulated white lines, one of which limits the external area, and is edged with black; a white disco-cellular spot; basal fourth brown, edged and traversed by black lines; an irregular dark brown costal spot beyond the middle; external area ferruginous internally and grey externally, the two colours separated by a crinkled white line, upon which, towards apex, is a black spot; a marginal series of linear black spots; fringe cream-coloured, traversed by a dark grey stripe; secondaries grey, with faint pink reflections; fringe nearly as in primaries; body grey; thorax brownish; primaries below dark sericeous-grey; a blackish Z-shaped character upon a whitish ground at the end of the cell; a golden apical costal patch, pale at the extremities, and crossed by brownish undulated stripes; secondaries whitish, densely irrorated with grey; a black disco-cellular spot; a dentate-sinuate blackish discal line, and

a submarginal series of ill-defined blackish edged white dots; palpi and pectus ochreous; venter greyish white. Expanse of wings, 20—21 mm.

"Valparaiso, in November."—*T. E.*

123. *Psaliodes pseudohalia*, n. s.

Like a *Thamnonoma* in appearance, but structurally like *Psaliodes*; primaries pearl-grey, sericeous; a black-edged brown costal dash at basal fourth, continued across the wings by two scarcely perceptible grey lines; base of costal margin blackish; a triangular black-edged brown spot at centre of costa, and between it and the inner margin traces of two or three undulated grey lines and one or two black dots; another black-edged brown costal spot beyond the middle, continued in the form of two irregular grey lines (the outer one undulated and dotted with black) to inner margin; two parallel dentate-sinuate lines and the external border dark grey; fringe pale buff, striped with dark grey; secondaries pale brownish grey, with fringe as in primaries; thorax whitish, back of head and a spot on each shoulder black; abdomen pale brownish; under surface brownish grey; secondaries paler than primaries, but irrorated with brown. Expanse of wings, 27 mm.

"Valparaiso, in November."—*T. E.*

124. *Psaliodes brevipalpis*, n. s.

Palpi short for the genus; general aspect of *P. signata*; primaries pale greyish brown, with a rosy flush; basal third chocolate-brown; an irregular narrow central grey belt with whitish margins; between the latter and the base and upon the disc are several whitish-edged grey-brown stripes; between those on the disc and a third series bounding the external border is an arched discal series of black-tipped longitudinal white dots; external border ash-grey; two submarginal black spots; fringe white, striped and spotted with dark brown; secondaries sericeous greyish brown; fringe almost as in primaries; body greyish brown; under surface dark grey-brown, with cupreous reflections; the secondaries and the costal border and external border of primaries speckled with white; the wings from beyond the middle

crossed by parallel undulated arched lines; veins of secondaries banded upon the disc with black and white; fringes as above; body brown. Expanse of wings, 24—27 mm.

"Corral, in February."—*T. E.*

Chalastra, *Walker*.

125. *Chalastra ? pusilla*, n. s.

Whitish; the primaries crossed near the base by two or three bronze-brown lines; a bronze-brown central belt somewhat like that of *Coremia ferrugata*, traversed by darker sinuated brown lines, and enclosing a small black disco-cellular spot; two sinuated submarginal lines and the outer border bronze-brown; two unequal white-centred submarginal spots towards apex; secondaries with a blackish disco-cellular spot and a widely sinuated pale brown line; body greyish; under surface white; primaries brownish; secondaries brown-speckled to the centre; black disco-cellular spots; primaries with a white submarginal spot; secondaries with a brown discal line as above. Expanse of wings, 20 mm.

"Valparaiso, in July."—*T. E.*

Docirava, *Walker*.

126. *Docirava ? chilensis*, n. s.

Aspect of a *Eupithecia*, excepting in its small secondaries; golden brown; primaries darker than secondaries, traversed by dark brown parallel undulated stripes; central belt clear of these stripes, but of the ground colour, its limits indicated by slender undulated black lines with pale and dark grey outer edges; two black spots placed obliquely at apex; a marginal series of black dots; fringe pale brown, traversed by a dark grey stripe; wings below pale golden brown; minute black disco-cellular dots; primaries with an angular blackish discal stripe; fringes of all the wings black-spotted; venter reddish. Expanse of wings, 27 mm.

"From Reed's collection."—*T. E.*

EUBOLIIDÆ.

PHYLLIA, *Blanchard.**

127. *Phyllia triangularia.* (Pl. XVI., fig. 11).

♀, *Phyllia triangularia*, Blanchard, in Gay's 'Fauna Chilena,' vii., p. 89, n. 1; pl. 7, fig. 5 (1852-4).
Eubolia ? liburnaria, Guenée, Phal., ii., p. 486, n. 1703 (1857).

"Valparaiso, all the year."—*T. E.*

The above note, which includes the following, inclines me to regard it as distinct; since, as already remarked, it is improbable that the same species should occur throughout the year.

128. *Phyllia cinerescens*, n. s.

Pattern and general coloration of the preceding, but both sexes with a well-defined ash-grey discal band across the primaries, limiting the central belt. Expanse of wings, 42—44 mm.

Valparaiso.

SARRACENA, *Herrich-Schäffer.*

129. *Sarracena olivacea*, n. s.

Nearly allied to *S. pellicata* of Felder, but differing, in both sexes, in the nearly straight outer edge of the central belt of primaries; the males vary in the colouring of the central belt and apical patch from blackish to greenish olive, and the females from dark to pale greenish olive, and in one example to red. Expanse of wings, 33—42 mm.

Two pairs of the typical dark form, one pair of the pale olive form,† and one female of the red type.

"Valparaiso, October and November."—*T. E.*

This note includes the two following species:—

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* The males have a projecting lobe from inner margin of primaries near the base.

† The male of this variety bears a label with the locality "Valdivia."

130. *Sarracena pellicata.*

♂, *Sarracena pellicata*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxi., fig. 27 (1875).

♂, ♀ (six examples). Valparaiso.

131. *Sarracena declinaria.*

♀, *Sarracena declinaria*, Felder and Rogenhofer, Reise der Fregatte Novara, v., pl. cxxxi., fig. 32 (1875).

One male. Valparaiso.

SIONIDÆ.

Siona, *Duponchel.*

132. *Siona columba*, n. s.

Allied to *S. fulgurata* ("*Eubolia*" *? fulgurata*, Snellen); above sordid silvery whitish, with the pale stripes of the under surface showing through the wing-texture; primaries below leaden grey, bronze or golden brown on costal margin and at apex, where there is a short transverse pale yellow stripe; secondaries dark bronze-brown; a longitudinal stripe parallel to the costal margin through the cell from base to outer margin, interrupted at the end of the cell by a short oblique dash, and on the disc by an angulated stripe from costa to abdominal margin; two oblique dashes on the abdominal area, and a marginal spot on the second median interspace; all pale yellow; body below cream-coloured. Expanse of wings, 32—33 mm.

Var. 1 with the longitudinal stripe of secondaries below not extending into the discoidal cell, but terminating as it reaches the angulated discal stripe. Expanse of wings, 31—32 mm.

Var. 2 altogether darker below, and differing from the preceding form in the macular character of the discal stripe of secondaries. Expanse of wings, 31 mm.

Var. 3 as dark below as the preceding form, the markings of secondaries reduced to a round spot at the end of the cell, a portion of the discal stripe and a longer or shorter longitudinal dash across it. Expanse of wings, 34 mm.

Var. 4 with no creamy yellowish stripes below, the subapical costal transverse dash being only indicated in pale grey; the secondaries also with a spot at the end of the cell, and an angular discal band of greyish white. Expanse of wings, 29 mm.

"Mountains of the hacienda of Cauquenes."—*T. E.*

This is, as may be seen from the above description, a very variable species, none of the forms being sufficiently constant to permit one to regard them for a moment as specifically distinct.

HETEROPHLEPS, *Herrich-Schäffer.*

133. *Heterophleps ophiusina*, n. s.

Whity-brown; a large irregular dark brown patch, but changing to pale brown on costal border, with black margins upon the basal half of primaries, its inner edge oblique and slightly arched, its outer edge elbowed upon the median vein, and more or less sinuated; immediately beyond this patch is a whitish belt which crosses the wing, and is bounded externally by a widely zigzag blackish and white stripe, widest towards the costa; external border irregularly dusky; a marginal series of almost sagittate black spots; fringe dark brown, traversed by two whitish lines; the whole surface of these wings is tinted with flesh-pink in certain lights and irrorated with blackish scales; secondaries brown-speckled; an ill-defined brownish spot at the end of the cell, and a slender discal line of the same colour; external border slightly flesh-tinted; fringe nearly as in primaries; head and thorax dusky; under surface bronze-brown; costa of primaries and entire surface of secondaries mottled with whitish; all the wings with indistinct dusky disco-cellular spots; fringes almost as above. Expanse of wings, 35 mm.

"Chiloë, from Reed's collection."—*T. E.*

This species reminds one of the genus *Ophiusa*.

134. *Heterophleps agitata*, n. s.

Primaries above silvery grey, with dark bronze-shot fuliginous-brown markings somewhat as in the preceding species; the patch on the basal half, however, is of a

uniform colour throughout, with its oblique inner edge quite straight, not arched; the sinuation of its outer edge is also angular, it is black-edged as usual; the whitish belt is of the ground colour and narrower than in the preceding species; it is bounded externally by a black and white line; there is also a semicircular subapical costal blackish brown patch and an irregular band of this colour from just above the middle of the outer margin to the inner margin, leaving an almost semicircular marginal patch of the ground colour at external angle; a marginal series of small black spots; fringe white, with two dark brown stripes; secondaries pale greyish brown, with marginal spots and fringe as in primaries; body silver-grey, the head and thorax slightly darker than the abdomen; under surface silvery whitish, washed with bronze-brown; costal border of primaries white, speckled with blackish; a black disco-cellular spot; fringe as above, but with grey stripes; secondaries irrorated with dark grey; a brown disco-cellular spot and undulated black-dotted discal line; fringe white, with two grey stripes; body minutely black-speckled. Expanse of wings, 31 mm.

"Valparaiso, in February."—*T. E.*

135. *Heterophleps stygiana*, n. s.

Dark smoky brown; primaries with nearly the pattern of the preceding species, but the outer edge of the patch on the subbasal area (which is only defined internally by an oblique black and white stripe) undulated; the outer edge of the pale post-median belt less strongly angulated towards costa, and regularly arched from the angulation to the inner margin; external area decidedly broader, separated from the narrow pale belt by a black stripe, with white external edge as usual; the inner half of the external area forms an angulated and arched dark fuliginous belt, limited towards apex by a whitish streak; the outer half is paler and greyish upon the margin, where there is a series of black spots; fringe whitish, traversed by a broad dark brown stripe; secondaries rather greyer than primaries; fringe the same; primaries below greyish brown; costa pale sandy yellow, speckled with blackish; fringe as above; secondaries sandy yellowish, irrorated with blackish scales; a small blackish disco-cellular spot; external area bronzy

brownish ; body dark greyish brown. Expanse of wings, 32 mm.

Var. *aurea.*

Primaries above golden yellow, sericeous, clouded with brown, the markings either cupreous-brown or only indicated in outline by brown stripes ; secondaries varying from bronzy grey to straw-yellow, with a slight flesh-tint ; body varying from greyish brown, with cupreous thorax, to pale stramineous ; under surface shining straw-yellow, the primaries sometimes washed with grey. Expanse of wings, 30—36 mm.

" Valparaiso, in February and March."—*T. E.*

TANAGRIDIA, n. g.

Wings ample, the primaries with acute apex, costa nearly straight, outer margin slightly arched (geschwungen), inner margin straight ; discoidal cell extending to just beyond the middle of the wing, rather broad ; all the veins perfectly normal, the median branches wide apart ; secondaries triangular, with slightly convex outer margin ; discoidal cell extending to the middle of the wing ; all the veins well separated ; body rather slender ; the thorax rounded ; palpi moderately long, compressed, curved, porrect, fringed above, extending its full length in front of the head ; antennæ curved, simple, excepting towards the tips, where they are subserrate, flattened ; legs long, thick, and compressed ; middle tibiæ terminating in two long divergent blunt spurs ; posterior tibiæ with an additional subterminal spur.

136. *Tanagridia fusca*, n. s.

Dark cupreous-brown above ; wings with white-tipped fringe ; a discal series of minute black and white dots across the primaries ; primaries below cupreous-brown, with a discal series of darker dots on the veins ; outer margin irrorated with white ; fringe white, traversed by a brown line ; secondaries greyish white, densely irrorated with cupreous-brown, especially towards the outer margin ; a spot at the end of the cell and a discal series, of darker brown ; body below paler cupreous-brown ; the tarsi almost golden below. Expanse of wings, 35 mm.

" Pines Valley, in November."—*T. E.*

HEDYLIDÆ.

CARPHOLITHIA, n. g.

Nearest to *Hedyle*; wings narrow, elongated; primaries acuminate at apex, with a very slight angulation of the outer margin at the end of the second median branch; body rather slender, but extending very slightly beyond the secondaries; palpi compressed, porrect, extending its full length in front of the head; antennæ simple; legs long and rather slender; spurs as usual, rather long.

137. *Carpholithia cinerea*, n. s.

Ash-grey; primaries with the basal three-fourths irrorated with blackish grey, crossed by two strongly angulated lines of the same colour, and limited by a third very slightly angulated line; external margin dusky; fringe tipped with blackish and traversed by a dusky line; secondaries very slightly brassy in tint, with a dusky marginal line; thorax ash-grey; the tegulæ black-tipped; abdomen slightly brassy; primaries below blackish grey, the external area rose-red, with four snow-white costal spots; a black marginal line; fringe grey, with a white basal line, and tipped with blackish; secondaries silvery white, grey-speckled; a brown lunate disco-cellular spot, and a black marginal line; fringe tipped with blackish; body below whity-brown. Expanse of wings, 26 mm.

Var. 1. Primaries above pearl-grey, with slight brownish reflections, the third dark grey stripe intersected by a whitish sinuous line, which at its upper end curves inwards to the costal margin; secondaries above dull silvery. Expanse of wings, 24—26 mm.

Var. 2. Primaries differing from those of the preceding species in having black orbicular and reniform spots, the latter crossed by a whitish line, in wanting the dark grey stripes almost entirely, though the sinuous whitish line is present, and in having a black spot at basal third of interno-median area; the secondaries show traces of a dusky discal line; primaries below with the external area silvery white, like the secondaries, which are speckled with dark brown, especially towards the base. Expanse of wings, 25 mm.

"Las Zorras, in March."—*T. E.*

138. *Carpholithia crambina*, n. s.

Primaries above golden stramineous, with a more or less defined longitudinal basal black interno-median streak; a more or less defined blackish diffused spot at the end of the cell; a more or less defined blackish stripe limiting the external border internally, and which when partly obsolete is replaced by a sinuous pale line, as in the preceding species; external border blackish towards apex; secondaries silvery white, more or less suffused with golden or cupreous brownish; body golden stramineous; under surface silvery whitish, shining; primaries golden towards the outer margin, otherwise sprinkled densely with blackish grey; secondaries slightly sprinkled with blackish scales towards the base; a conspicuous black disco-cellular spot and a blackish marginal line; fringe traversed by a pale grey stripe; body below yellowish. Expanse of wings, 24 mm.

"Las Zorras, in March."—*T. E.*

Explanation of Plate XVI.

Fig. 1. *Perusia conspersa*, ♂, Butler.
2. *Tetracis chilenaria*, ♂, Blanchard.
3. *Paragonia deustata*, ♂, Felder and Rogenhofer.
4. *Erosina cervinaria*, ♂, Blanchard.
5. *Azelina felderi*, ♂, Butler.
6. *Psamatodes chilenaria*, ♂, Blanchard.
7. *P. ferruginaria*, ♂, Blanchard.
8, 9. *Pachrophylla lineata*, ♂, ♀, Blanchard.
10. *Rhopalodes virescens*, ♀, Philippi.
11. *Phyllia triangularia*, ♂, Blanchard.
12. *Monoctenia dentilineata* ♂, Butler.
13. *M. chilenaria*, ♂, Felder and Rogenhofer.

XVI. *North American Coleophoræ.* By Lord Walsingham, M.A., F.Z.S., &c.

[Read July 5th, 1882.]

Plate XVII.

In Mr. Chambers' "Index to the described Tineina of the United States and Canada" in the 'Bulletin of the United States Geological and Geographical Survey,' vol. iv., published at Washington in 1878, we find enumerated no less than forty-four species of the genus *Coleophora*, in addition to which three others only, so far as I am aware, have been described as occurring in that country. These three are *Coleophora ciliæochrella*, Cham. (Can. Ent., vi., 129), *C. inornatella*, Cham. (Cin. Soc. Nat. Hist., ii., 185), *C. malivorella*, Riley (Agricl. Rep., 1878, pp. 48, 49, pl. vii., fig. 1).

Several species of this genus were contained in some American collections lately sent to me for examination by Professor C. H. Fernald, but for the most part they were in poor condition, and unaccompanied by their larval cases. I therefore abstained from describing those of them which appeared to be new, although I was able (in a paper lately sent to America for publication) to suggest in two instances a probable rectification of synonymy. In a box received at the same time from Professor C. V. Riley were bred specimens of some interesting species of *Coleophora*. I regret that, being under a misapprehension of my kind correspondent's liberal intentions, I returned them to him with all others, which, like these, were labelled "unique." Professor Riley has now sent me the larval cases from which they were bred. Postponing detailed descriptions until specimens no longer "unique" can be referred to, I propose to notice them shortly here. The first of these seemed to me to agree with the description of *Coleophora ciliæochrella*, Cham. (Can. Ent., vi., 129), and I returned it as possibly belonging to this species; the arrival of the larval cases attached to the seeds of a species of *Juncus*

show it to be the well-known European *Coleophora cæspititiella*, Zell. Whether it is or is not the species described by Mr. Chambers I am unable to determine without access to his typical specimens.

I am indebted to Professor Riley for calling my attention to a paper by Dr. W. S. Barnard in the Proc. Am. Ass. Adv. Sci., 1879, p. 472, in which it is suggested that one of two probably distinct species of *Coleophora* feeding on *Juncus* will be found to be *C. cæspititiella*. I have not yet been able to refer to this paper.

A second species in Professor Riley's box was evidently so closely allied to *Coleophora currucipennella*, Zell. (Wocke, Cat., 2426) that I wrote to ask for some description of the larval case from which it was bred. This is now before me, and is, I think, in itself sufficient evidence of the identity of the North American and European forms. This black pistol-formed case, with loose lateral wings or flaps about its widest part, was found on oak, the natural food-plant of *C. currucipennella*.

The third species, which appeared to be very closely allied to *C. annulatella*, Tgstr. (Wocke, Cat., 2546) forms its case, as I am informed by Professor Riley, of bits of a species of *Polygonum*, upon which it feeds. It covers the case, like its European ally, with grains of sand, and with these are what appear to be some black seeds of the food-plant. The case is rougher, and lies more flatly on the surface of the leaf than that of *C. annulatella*, having the mouth bent under, the opening being placed nearly at a right angle. I am not aware that the European species has ever been found upon *Polygonum*, its natural food-plants being species of *Atriplex* and *Chenopodium*.

A fourth example, reared from a larva feeding on *Prunus americana*, appears to answer to the description of *Coleophora rufolutella*, Cham. (Can. Ent., vi., 129), a species which Mr. Chambers subsequently (Can. Ent., x., 112, 113) regarded as equivalent to *C. caryæfoliella*, Clem., described (Proc. Ent. Soc. Phil., i., 78) as feeding on hickory, and perhaps on dogwood, in a "small dark brownish case of the form of a flattened simple cylinder," which not inaptly applies to the case now received from Professor Riley.

The food-plant of the species now under consideration is, however, so completely distinct from that of Dr. Clemens' species that it is most unlikely that the insect can be the same.

In referring *C. rufoluteella*, Cham., to *C. caryæfoliella*, Clem., Mr. Chambers remarks that *rufoluteella* is known only from specimens captured one mile from hickory. It seems not impossible that I may have rightly identified Professor Riley's specimen as the true *C. rufoluteella*, and that it may be really distinct from the hickory-feeding species; but further evidence is required to decide the point. This case is represented on Plate XVII., fig. 18.

By far the most interesting larval case received from Professor Riley is that which belongs to a small, rather inconspicuous, species allied to *C. unipunctella*, Zell., and probably to *C. biminimaculella*, Cham., the position of the two small spots on the fore wings being probably sufficient to separate it from both these species.

The case may be described as pale dust-coloured, spiniform, and octagonal, tapering to a blunt point, beautifully constructed of elongate particles of larval excrement built up in a perfectly symmetrical arrangement, which will be best appreciated in the figure which accompanies this paper. On each flat side of the octagonal figure the little bricks of frass are woven in so that the end of each one fits exactly between the ends of the two similar bricks of the adjoining facies to its right and left. From the upper edge of the anterior opening of the case a loose expanded veil of the same building material, connected by silk, is arranged so as to protect the head of the feeding larva, and this veil is probably gradually taken up and utilised in the much closer woven structure of the octagonal case itself.

I received some years ago at Washington, from Professor Townend Glover, a somewhat similar case from leaves of vine, but Professor Riley informs me that his specimen was found on leaves of *Persea carolinensis*.

I would suggest the name *Coleophora octagonella* for this species, if, as I believe, it is still undescribed. The case is represented on Plate XVII., fig. 17.

The following are species which I am unable to recognise by comparison with any published descriptions. These, with one exception, were collected by myself in California and Oregon, in 1871-2.

It is very probable that some at least of the numerous species already noticed by American lepidopterists as

occurring in that country may ultimately be found to be identical with known European forms; but without some knowledge of the larval cases it will be difficult to establish their identity, and the information at our disposal is insufficient to justify an attempt at present to revise the synonymy of the American representatives of the genus.

Coleophora viridicuprella, n. s. (Pl. XVII., figs. 2, 2*a*).

Palpi greenish bronzy, with a very slight tuft at the end of the second joint. Antennæ annulated with greenish bronze and white. Fore wings unicolorous greenish bronzy, with greyish fuscous cilia. Hind wings pale brownish fuscous, with pale greyish fuscous cilia. Legs greyish fuscous, the tarsi paler, the joints faintly spotted with whitish on their outer sides. Abdomen steel-grey above and beneath, the anal tuft paler. Expanse, 9 mm.

Two specimens bred from short greyish fuscous cases, with the mouth slightly turned downwards, anteriorly cylindrical, posteriorly somewhat flattened, and having a flattened ochreous keel along their under sides. Found attached to stems of a grass or rush, Mendocino County, California, May 29th, 1871. Also two specimens taken on the wing at Crescent City, Oregon, June 19th, 1872.

Mr. Chambers' description of *C. œnusella* is so incomplete that I am quite unable to judge whether this species is indicated. The only reference I can find to *C. œnusella* is in Can. Ent., vi., 128: "Greenish bronzy; posterior wings pale fuscous. Al. ex. 5 lines." He places it in his section of the genus having the "antennæ and palpi both simple."

The very small tuft of hair-like scales at the apex of the second joint of the palpi in my species might easily be overlooked.

Coleophora cornella, n. s. (Pl. XVII., figs. 1, 1*a*).

Palpi whitish, outwardly tinged with ochreous, the second joint distinctly tufted. Antennæ with the basal joint enlarged and slightly tufted, annulated beyond it with white and pale ochreous. Head whitish ochreous. Thorax and fore wings unicolorous dull ochreous, the

extreme costal margin slightly tinged with fuscous at the base. Cilia ochreous. Hind wings greyish fuscous, with ochreous cilia. Expanse, 15 mm.

Bred from larvæ feeding in a curiously-shaped case on leaves of *Cornus pubescens*, Nutt., at Burney Creek; emerged in August at Mount Shasta, California. August, 1871.

The case of this species is formed of a piece of the leaf of the food-plant, anteriorly blackish, posteriorly shading to brown; the mouth is slightly turned over, and above it the case is gradually flattened laterally, bulging considerably beneath about the middle, attenuated beyond the middle, and from thence dilated and slightly bent downwards to a square end.

Although in size considerably larger, this species is not impossibly *Coleophora ochrella*, Cham.; if it is so I owe Mr. Chambers an apology for redescribing it; but the name *ochrella* is preoccupied, having been frequently used in published lists for *C. ochrea*, Haworth, a name in itself so near to "*ochrella*" as to cause some apprehension of confusion if both were permitted to remain as applied to two distinct species.

I have two much smaller specimens also from California, which I regard as the true *C. ochrella*, Cham.; these show no signs of a tuft at the base of the antennæ.

Coleophora glaucella, n. s. (Pl. XVII., figs. 3, 3*a*).

Palpi whitish, mixed with brownish ochreous, with a slight tuft on the second joint. Antennæ with the basal joint whitish above, having a short brownish ochreous tuft beneath, distinctly annulated with black and white beyond the first three or four basal joints. Head whitish at the sides, tinged with brownish ochreous above. Thorax and fore wings brownish ochreous, profusely and evenly irrorated with white scales; these are sometimes predominant on the outer half of the wing, but not in all specimens. Cilia pale brownish ochreous. Hind wings pale brownish ochreous. Cilia rather more greyish. Legs and abdomen brownish ochreous, somewhat sprinkled with whitish scales. Expanse, 13 mm.

Thirty-one specimens bred from larvæ feeding on leaves of *Arctostaphylos glauca*, Lindl., collected near San Francisco, May 20th, 1871; bred July 6th to July 30th.

The case is very like that of the preceding species, *C. cornella*, in form, but is much shorter and more stunted, more rounded at the apex, and generally of a darker hue.

Coleophora irroratella, n. s. (Pl. XVII., fig. 5).

Palpi greyish fuscous, whitish on their inner sides, not tufted. Antennæ with a slight tuft beneath the basal joint (which with the head is dirty whitish), the stem distinctly annulated with brown and white. Fore wings white, irrorated with deep brown scales, which form into groups constituting two spots, one on the middle of the wing, the other immediately above the anal angle. The brown scales sometimes form a slight streak about the middle of the fold, and are thickly collected also at the extreme apex of the wing. Cilia pale brownish grey. Hind wings and cilia pale brownish grey. Abdomen greyish. Legs slightly paler. Posterior tarsi very faintly annulated. Expanse 12 to 13 mm.

Three specimens taken at the end of July and beginning of August, 1871, on and near Mount Shasta, California.

Coleophora wyethiæ, n. s. (Pl. XVII., figs. 4, 4*a*).

Palpi white, with the second joint tufted. Antennæ white, without fuscous annulations, the basal joint slightly enlarged, not tufted. Fore wings white, faintly smeared with pale ochreous, with which the white cilia are also very slightly tinged. Hind wings very pale brownish ochreous, with a slight pinkish gloss in some lights. Cilia faintly tinged with brownish ochreous on their basal half. Abdomen greyish ochreous above, with a pair of short dark lines on each segment; anal tuft whitish. Legs white; the two anterior pairs with a few fuscous scales on their outer sides; tarsal joints not annulated. Expanse, 16 mm.

Allied to *Coleophora anatipennella*, Hüb., but differing in the absence of a tuft at the base of the antennæ, and in having no fuscous annulations on the antennæ and tarsi. It has no dusting of dark scales on the fore wings, as in *C. artimisicolella*, Cham.

Bred July 31st, 1871, from cases found July 19th near

Pit River, California, on *Wyethia angustifolia*, Nuttal; the case is elongate, cylindrical, tapering posteriorly, brown, and sometimes slightly bent towards the apex; the mouth slightly oblique.

I met with the same species on the wing at my Rouge River camp, in Oregon, as early as May 7th, 1872, from which it would appear that the species may be double-brooded.

Coleophora discostriata, n. s. (Pl. XVII., figs. 6, 6 *a*).

Palpi white, fuscous externally, with the second joint tufted. Antennæ with a long white tuft on the basal joint, annulated with pale fuscous beyond their basal fourth. Fore wings white; the extreme costa fuscous on the basal fourth; a conspicuous brownish fuscous streak, leaving the base below the costa, becoming gradually wider as far as the end of the cell, terminates in the costal fringes before the apex, sending a line of fuscous scales to the apex itself; from this streak a short slender line of fuscous scales sometimes diverges near the base for a short distance parallel to and above the fold. There are one or two short streaks of fuscous scales between the fold and the dorsal margin. Cilia pale greyish fuscous. Hind wings and cilia greyish fuscous. Legs white, the two anterior pairs strongly tinged with fuscous externally; the third pair with only a few fuscous scales; tarsi not annulated. Abdomen greyish fuscous, anal tuft paler; under side whitish. Expanse, 16 mm.

One specimen, apparently having just emerged from a pistol-formed case on leaves of a species of oak; two others taken on the wing, in July and August, at and near Mount Shasta, California, 1871. The case with which I have every reason to believe this species to be associated is pistol-formed, with a rounded excrescence on its under side in a position to represent the trigger-guard; the apex of the case is rather small, the mouth oblique, and the apical portion, or that which may be taken to represent the stock, is rather blackish and decidedly darker than the greyish ochreous barrel end; and there is a slight flange or keel at the junction of the two portions.

Coleophora accordella, n. s. (Pl. XVII., fig. 7),

Palpi white, fuscous externally, with a few projecting scales from the end of the second joint beneath. Antennæ with the basal joint white, with a short tuft below, annulated beyond it with white and dilute fuscous. Head and thorax white. Fore wings bright yellow from the base of the costa to the middle of the dorsal cilia, shading upwards and outwards into brownish ochreous; a broad white streak along the costa, coming to a point above the apex; a white streak along the fold, not quite reaching to the middle of the dorsal cilia, where there are a few white scales; an attenuated white streak from the base, along the dorsal margin to the commencement of the dorsal cilia, which are greyish ochreous. Hind wings and cilia pale brownish fuscous. Third pair of legs white, clothed above with long pale brownish fuscous hair-like scales. Expanse, 14 mm.

Nearly allied to *discordella*, but a broader winged and generally rather larger insect, with a more decidedly yellow tinge along the base and dorsal margin.

One near San Francisco, May, 1871; one on Rouge River, May 7th, 1872.

Coleophora tenuis, n. s. (Pl. XVII., fig. 8).

Palpi white, outwardly stained with fuscous; second joint slightly tufted. Antennæ white, with the basal joint white, and some long yellow-ochreous scales scarcely amounting to a tuft beneath it. Head and thorax white, touched with yellow-ochreous. Fore wings pale yellow-ochreous, with the costa, the first half of the dorsal margin, and a streak along the fold, white; a slender white streak above the fold, beginning before the middle of the wing and ending below the apex; a few scattered fuscous scales following the lines of the white streaks and about the apex; these are not visible in some specimens. The costal cilia whitish. Dorsal cilia brownish fuscous; below the apex white; hind wings greyish fuscous; cilia brownish fuscous; first pair of legs externally brownish; hind legs white. A slender narrow-winged species, with the apex much attenuated. Expanse, 17 mm.

Five specimens taken in Shasta County in July, and

ten specimens on Mount Shasta in August, 1871. A variety or perhaps a distinct species, has the same markings, but the fore wings darker, more brownish ochreous; two specimens from Shasta.

Coleophora ochrostriata, n. s. (Pl. XVII., fig. 9).

Palpi white externally, smeared with fuscous, the second joint with a slight tuft. Antennæ with the basal joint not tufted; faintly annulated, except towards the base, with white and pale fuscous. Head and thorax white, tinged with ochreous above. Fore wings white, the extreme costal margin at the base touched with fuscous, evenly sprinkled with scattered fuscous scales beyond the basal fourth, and with two yellow-ochreous streaks *from the base;* one below the fold reaching to the dorsal fringes, *but not following the margin of the wing;* the other along the middle of the wing to the apex slightly dilated before the middle; a few yellow-ochreous scales above the middle of the dorsal fringes; costal and dorsal fringes pale brownish fuscous. Hind wings and cilia the same. Posterior legs white. Expanse, 16 mm.

Nineteen specimens near Pit River, California, July 29, 1871.

This species must be nearly allied to *C. linea-pulvella*, Chambers (Can. Ent. vi. 130).

The words printed in italics indicate some of the points in which it differs from the description of that species. It is also somewhat larger.

Coleophora lynosyridella, n. s. (Pl. XVII., figs. 10, 10 *a*).

Palpi whitish ochreous, darker externally, very long, with the second joint clothed with long hair-like scales, but not tufted. Antennæ greyish white, the basal joint not enlarged, nor tufted. Head and fore wings whitish ochreous, the extreme costal margin near the base tinged with fuscous, the ends of the costal cilia greyish; a conspicuous brownish streak arising at the base below the costa, much mixed with fuscous scales, sends a brownish fuscous streak towards the middle of the costa, and beyond this three other diverging brownish streaks to the costal fringes, along the base of which they form together a brownish fuscous streak, ending at the apex,

which is slightly falcate. There is a streak of brownish and fuscous scales along the fold, and some scattered brown scales along the dorsal margin and at the base of the dorsal cilia, which are shaded with greyish fuscous. Hind wings pale greyish, with greyish ochreous cilia. Legs dingy whitish, the tarsi not annulated. Abdomen greyish ochreous above, barred with greyish ochreous, and dingy white beneath. Expanse, 25 mm.

Bred from larvæ in elongate cylindrical cases, somewhat bulged along the middle, having the mouth slightly turned downwards; of a dull ochreous tint, streaked longitudinally around the middle with lines of blackish particles, apparently of excrement. I met with this species on Mount Shasta, California, in August, 1871, feeding on leaves of *Lynosyris viscidiflora*, where I bred and captured several specimens. It is a fine, large, and distinct species. I have specimens of both sexes.

Coleophora nigrostriata, n. s. (Pl. XVII., fig. 11).

Palpi white, the second joint with an ochreous streak on its outer side, slightly tufted. Antennæ white, the basal joint scarcely enlarged, not tufted. Head and thorax white, faintly tinged with ochreous. Fore wings bright ochreous, with a conspicuous white streak from the base to the middle of the dorsal cilia, margined with black scales on both sides. The extreme costal margin fuscous at the base; a white streak along the costa from the base to the apex, somewhat dilated beneath the white costal cilia; margined on its lower edge by a line of black scales, extending as far as the middle of the wing, beyond the middle by three separate small groups of black scales; a white streak along the basal third of the dorsal margin, bounded on its upper side by a line of black scales; a white streak beyond the middle, continued from the median streak along the base of the dorsal cilia, with two separate groups of black scales upon its upper edge; extreme apex fuscous and somewhat falcate; dorsal cilia pale fulvous. Hind wings and cilia pale fulvous. Abdomen whitish ochreous. Legs white. Expanse, 12½ mm.

A small but beautiful species of the group to which *C. lixella* belongs. A single specimen, in beautiful condition, taken on the coast of Oregon, June, 1872.

Coleophora bella, n. s. (Pl. XVII., fig. 12).

Palpi white, the second joint slightly tufted. Antennæ white, with the basal joint clothed with coarse scales, projecting in a short tuft below. Head white, tinged with ochreous below and behind the eyes. Fore wings bright yellowish ochreous, the apical fifth more or less suffused with reddish brown, running to a point at the extreme apex; a silvery white streak from the base, above the fold, to the dorsal cilia; the costal margin and costal cilia white (I have one specimen in which the costal margin is not white near the base, and in which the apical third is entirely suffused with reddish brown); the dorsal margin narrowly white at the base; cilia fuscous. Hind wings pale brownish; cilia fuscous. Abdomen whitish ochreous; anterior legs suffused with fuscous; posterior legs white. Expanse, 12 mm.

Five specimens taken in June and August, 1871, in Mendocino and Siskiyou Counties, California.

Allied to *C. nigrostriata*, but without the black margins to the white streaks.

Coleophora viscidiflorella, n. s. (Pl. XVII., figs. 13, 13 *a*).

Palpi whitish, with some brownish scales externally, not tufted. Antennæ conspicuously annulated with white and brownish fuscous, with the basal joint white above, enlarged and clothed with long coarse scales, but not tufted. Fore wings white, much besmeared with brownish ochreous, except about the costal and apical portion; the extreme costal margin fuscous at the base; several irregular lines of scattered fuscous scales, the most conspicuous being one beneath the costa from the base, and one along the fold; with two or three shorter oblique ones near the costal cilia, and one at the extreme apex, which is not falcate. Cilia white at the apex, merging into greyish fuscous above and beneath. Hind wings pale greyish, with greyish ochreous cilia; the bases of the posterior tarsal joints tinged with fuscous externally. Expanse, 15 mm.

In the general tint of the coloration this species is not unlike the larger *C. lynosyridella*, which feeds upon the same plant; but it is much smaller, and has annulated antennæ, with a distinctly enlarged basal joint. I found

it flying at Mount Shasta, California, in August, 1871, and bred a single specimen from a case found there on *Lynosyris viscidiflora*. The case has a very different form from that of *C. lynosyridella*, being slender, elongate, cylindrical, greyish white, with the mouth slightly turned downwards, and the apex compressed into a triangular form by being flattened on three sides; the length of the case is 13 mm.

Coleophora acutipennella, n. s. (Pl. XVII., fig. 14).

Palpi white, streaked with fawn-colour on their outer sides, with a white tuft on the second joint. Antennæ with the basal joint whitish ochreous, thickly scaled, not tufted; the stem annulated with white and fuscous. Fore wings fawn-colour, with a narrow white line along the dorsal margin, and a rather wider one along the costal margin, running around the base of the greyish ochreous costal and dorsal fringes to the very acutely-pointed fawn-coloured apex; within these lines are a conspicuous white streak above, and parallel to the fold, running from the base to near the middle of the dorsal fringes; a smaller and less defined streak running parallel to this, below the fold, but shorter; from the costal fringes are four white streaks pointing inwards towards the base, the last very small, immediately before the apex, the one nearest the base being the most important; opposite to these are two very small white streaks from the dorsal fringes, also pointing inwards; these are not always well defined. Hind wings greyish; cilia greyish ochreous. Abdomen whitish ochreous. Legs yellowish white; tarsi not annulated. Expanse, 16 mm.

Twelve specimens taken in Shasta County, California, July 28th, 1871, and a single specimen on Mount Shasta a few days later.

Coleophora bipunctella, n. s. (Pl. XVII., fig. 15).

Palpi whitish, a few projecting scales from the second joint. Antennæ white, basal joint enlarged, not tufted (it has the appearance of having had a slight tuft which has been worn off, although the specimen is otherwise in good condition). Fore wings pale yellow, the costal and dorsal margins narrowly white; there is a white streak

along the whole length of the fold, beyond the middle of which are sometimes two or three black scales; above the fold, from beyond the middle of the cell to the dorsal margin below the apex, is another short white streak, containing two distinct black dots or spots; the extreme apex is black, with black spots at the base of the cilia, on the costal and dorsal margins above and below it. Cilia white, pale grey above the anal angle. Hind wings and cilia pale grey. Third pair of legs tinged with ochreous. Expanse, 10 mm.

A single specimen in my collection, received some years ago from Texas (Belfrage).

Coleophora castipennella, n. s. (Pl. XVII., figs. 16, 16*a*).

Palpi somewhat thickly clothed, white, the apical joint brown above. Antennæ white, distinctly annulated with brownish ochreous, having a very long and conspicuous white tuft on the basal joint. Fore wings white, without any sprinkling of dark scales. Cilia pale greyish ochreous. Hind wings grey, with pale greyish ochreous cilia. Abdomen greyish. Legs white, the tarsal joints touched with pale greyish fuscous. Expanse, 14—17 mm.

The larval case is pistol-shaped, without projecting flaps at the sides, pale brownish; sometimes blackish above and beneath, but not entirely black, as that of *Coleophora anatipennella*, Hüb., from which it differs in being somewhat thickened laterally about the middle, where there is a curved transverse mark on its upper side, giving it the appearance of being constructed in two separate stages. There is a slight projection also on the under side, in the position which might be occupied by the trigger-guard of the pistol. The mouth of the case is oblique, causing it to incline at about the half of a right angle from the surface of the leaf on which it rests. Length of case, 8 mm.

Two specimens found feeding on a species of *Salix* in Lake County, California, June 26, 1871; others taken near Pit River in the middle of July.

Explanation of Plate XVII.

Fig. 1. Fore wing of *Coleophora cornella.*
1*a*. Larva case of ,, ,,
2. Fore wing of *C. viridicuprella.*
2*a*. Larva case of ,,
3. Fore wing of *C. glaucella.*
3*a*. Larva case of ,,
4. Fore wing of *C. wyethiæ.*
4*a*. Larva case of ,,
5. Fore wing of *C. irroratella.*
6. Fore wing of *C. discostriata.*
6*a*. Larva case of ,,
7. Fore wing of *C. accordella.*
8. Fore wing of *C. tenuis.*
9. Fore wing of *C. ochrostriata.*
10. Fore wing of *C. lynosyridella.*
10*a*. Larva case of ,,
11. Fore wing of C. *nigrostriata.*
12. Fore wing of *C. bella.*
13. Fore wing of *C. viscidiflorella.*
13*a*. Larva case of ,,
14. Fore wing of *C. acutipennella.*
15. Fore wing of *C. bipunctella.*
16. Fore wing of *C. castipennella.*
16*a*. Larva case of ,,
17, 17*a*—*b*. Larva case of *C. octagonella.*
18. Larva case of *C. rufoluteella.*

XVII. *Description of a new genus and two new species of* Psyllidæ *from South America.* By John Scott.

[Read July 5th, 1882.]

Plate XVIII.

Amongst several novelties sent me from Buenos Ayres by my friend Señor Dr. Don Carlos Berg were several specimens of each of the two following species of *Psyllidæ*, to which he called my particular attention, and requested me to describe them. He was also thoughtful enough to send them accompanied by some twigs and leaves of the trees which they infested that I might be made familiar with their mode of attack; and in order, if possible, to be of service to future collectors in that region, I have given figures of the same, which I believe will be of more practical value than it is possible to express in the very best description.

PSYLLINÆ.

Psylla Duvauæ. (Pl. XVIII., figs. 1–1*g*).

♂. Obscure fuscus vel piceo-fuscus. Caput fuscescenti-flavum. Lobi faciales perbreves, late rotundati. Antennæ breves, flavescentes; articulus tertius quarto longior; sextus etc. ad decimum fusci. Pro- et mesonotum convexa, illud fuscescenti-flavum, hoc obscure fuscum vel piceo-fuscum; spatium centrale linea fuscescenti-flava in medio sæpius notatum; pars posterior sive scutellaris fuscescenti-flava. Elytra clare pellucida, brevia, latitudine sua circiter duplo longiores; stigma cellulæ costali basali per medium emensæ longitudine fere æquale; radius vix nisi rectus; brachii cubitalis superioris furca parva, inferioris magna; distantia inter stigmatis apicem et radium eadem fere quæ radium a proximo furcæ ramo (secundum nervum marginalem) sejungit; distantia inter brachii inferioris ramorum apices alterutri priorum distantiarum (simili mensura adhibita) fere æqualis. Pedes flavi, subfuscescentes. Abdomen cum genitalibus nigrum; laminæ genitalis margines a latere visi fere

paralleli, latitudine basali paulo altiores ; stili breves, laminam versus incurvati, ad apicem teretiusculi, basi altitudini suæ fere æquales.

♂. Dark brown or pitchy brown. Head brownish yellow. Face lobes very short, broadly rounded. Antennæ short, yellowish ; 3rd joint longer than the 4th ; 6th to 10th joints fuscous. Pro- and mesonotum convex, the former brownish yellow, the latter dark brown or pitchy brown ; central portion frequently with a brownish yellow line down the middle ; posterior or scutellar portion brownish yellow. Elytra clear, transparent, short ; length about equal to twice the breadth ; stigma about equal in length to the costal basal cell measured through the centre ; radius almost straight ; furcation of the upper arm of the cubitus small, of the lower arm large ; distance between the apex of the stigma and radius about equal to that between the latter and the adjoining branch of the furcation, when measured on the marginal nerve ; distance between the apices of the branches of the lower arm about equal to either of the former when measured similarly. Legs yellow, with a slight fuscous shade. Abdomen black ; genitalia black ; genital plate margins, viewed from the side, almost parallel ; height a little more than the width at the base ; processes short, curved towards the genital plate, slightly tapering towards the apex ; base about equal to the height.

Head : crown brownish yellow, posteriorly towards the eyes dark brown. Face brownish yellow ; length down the centre a little more than one-half the breadth between the eyes ; face lobes brownish yellow, very short, broadly rounded. Antennæ short, yellowish, 6—10 joints fuscous, 9—10 darkest, slightly clavate. Thorax : pronotum convex, brownish yellow ; mesonotum, anterior portion (dorsulum) brownish yellow, darkest anteriorly ; central portion dark brown or pitchy brown, with a broadish brownish yellow line down the middle ; posterior or scutellar portion brownish yellow ; sides narrowly dark brown or pitchy brown. Elytra short, clear, transparent, or sometimes with a faint fuscous cloud next the apex ; length about equal to twice the breadth ; greatest breadth near the apex of the stigma ; dorsal margin convex from the apex of the clavus ; stigma generally dark brown, about equal in length to the costal basal cell measured through the centre ; radius joining the marginal nerve about in a line with the inner branch of the furcation of the upper

arm of the cubitus; distance between the apices of the stigma and radius about equal to that between the latter and the adjoining branch of the furcation, when measured on the marginal nerve; lower furcation large; distance between the apices of the branches about equal to either of the former when measured similarly. Clavus with a short black streak on the marginal nerve next the apex. Legs yellow, with a slight fuscous shade. Abdomen black; side margins narrowly reddish; genitalia black; outer margin of the genital plate, viewed from the side, slightly convex; inner margin slightly concave; width at the base somewhat less than at the apex; height about one-third more than the width at the base; processes short, curved towards the genital plate, slightly tapering towards the apex; base about equal to the height. Length, 1 line (Paris).

The young live and develop in beautifully-shaped, almost semiglobular, galls formed on the under side of the leaves of *Duranta dependens*, DC.

Hab. Buenos Ayres.

TRIOZINÆ.

NEOLITHUS.*

Caput cum oculis pronoto latitudine æquale; longitudo ejus media latitudini dimidiæ fere æqualis. Lobi faciales breves. Antennæ breves, subincrassatæ, ad dorsuli marginem posteriorem usque, vel ultra, extensæ; articulus ultimus subclavatus. Pronotum angustum. Mesonotum convexum, apud elytrorum insertionem capite cum oculis duplo latius; dorsulum antice in spinam longam utrinque productum; longitudo media latitudine brevior; margo posterior vix nisi semicircularis. Elytra nervulis tribus, apice plus minus late rotundata; radius elongatus, apice ipso aut prope apicem terminatus; cellulæ costalis et dorsalis breves; cubiti brachium inferius perbreve; clavus parvus, angustus; sutura clavalis tenuissima.

Head, together with the eyes, as broad as the pronotum; length down the centre about equal to half the breadth. Face lobes short. Antennæ short, somewhat stout, reaching to or beyond the posterior margin of the dorsulum; apical joint slightly clavate. Pronotum

* Νέος, new; λίθος, a gem.

narrow; mesonotum convex, twice as broad across the insertion of the elytra as the head and eyes together; dorsulum on each side anteriorly produced into a long spine; length down the centre not so long as the breadth; posterior margin almost semicircular. Elytra with three nervelets; apex more or less broadly rounded; radius long, terminating in or near the apex; costal and dorsal cells short; cubitus lower arm very short; clavus small, narrow; claval suture very fine.

Neolithus fasciatus. (Pl. XVIII., figs. 2—2*f*)).

Pallide fusco-flavus. Caput pallide fusco-flavus. Vertex inter oculos longitudine sua media duplo latior; margo anterior rotundatus, medio profunde excisus; foveæ distinctæ. Lobi faciales pallide fusco-flavi, breves, apice rotundati, desuper haud conspiciendi, antennarum radicibus fere obtecti, sese invicem non tangentes. Antennæ flavæ, brevis, pilis parcius obsiti; articuli primus et secundus brevis, crassi; tertius longissimus; quartus ad octavum apice nigri; nonus et decimus nigri, hic subclavatus. Oculi saturate purpurei, desuper conspecti paulo plus quam semiglobosi. Ocelli splendidi, rufi. Thorax: pronotum pallide fusco-flavum, medio latissimum, lateribus angustum, in bullam parvam flavidam ampliatum; mesonotum fuscum, leviter pilosum, convexum; dorsulum antice valde convexum, lateribus subcoarctatum; anguli laterales in spinam longam flavescentem producti; discus postice explanatus, medio plus minus flavescens seu fusco-flavus; spatium centrale medio explanatum, linea media lata, alteraque utrinque laterali, flavidis, plus minus distinctis; pars scutellaris sive apicalis flavescens; margo anterior concavus; anguli acuti. Elytra clare hyalina, longitudine latitudinem duplo quartaque parte fere excedente; apice late rotundata; nervis tenuibus, nigris, seu fusco-nigris; nervus marginalis fuscus vel rufo-fuscus, macula basali obscura, seu nigra, rhombica, vittaque perangusta, aterrima, figuram ⌄ referente, quæ cellularum basalium nervos marginales interiores percurrit; cellulæ costalis apex in eadem fere linea cum apice cellulæ dorsalis positus; radius basi latissimus, cubiti brachium superius modo non attingens, costam versus ante medium, et ultra, convexus nervoque costali (post costali) paulo ante apicem incurrens; vena ulnaris statim a basi leviter incurvata;

cubiti brachium superius elongatum, inferiore triplo longius, costam versus convexum; brachium inferius breve, ad basin leviter incurvatum; ramus interior brachio paulo longior ad basin curvatum; utrique brachio distantia inter ramorum apices fere eadem; clavus parvus, angustus, sutura tenuissima et nonnullis in situbus ægre cernenda; nervuli distincti, nigri. Pedes fusco-flavi, pilis obscuris, semierectis, subrigidis, brevissimis, dense obsiti. Femora in ipso apice intus macula minuta nigra plerumque notata. Tarsi supra nigri, inferius rufi. Abdomen, ♂, supra obscure fuscum, basi macula flavescente vel fusco-flava insignitum; lamina genitalis sordide ex albo fusca, subpilosa; margo posterior, a latere visus, in unguiculum vel dentem brevem obtusum productus; margo interior apice latissimus, late rotundatus; stili fusci, breves, crassi, clavati, laminæ genitalis dimidiam fere altitudinem attingentes. Abdomen, ♀, supra obscure fuscum, crassum, postice late rotundatum; laminæ genitales desuper aut infra visæ tenues; a latere conspectarum basis longitudine vix paulo brevior; lamina inferior superiore brevior.

Pale brownish yellow. Head pale brownish yellow. Crown between the eyes twice as broad as the length down the centre; anterior margin rounded, deeply notched in the middle; foveæ distinct. Face lobes pale brownish yellow, short, rounded at the apex, not visible from above, nearly covered by the insertion of the antennæ, not touching each other. Antennæ yellow, short, very sparingly clothed with hairs; 1st and 2nd joints short, stout; 3rd longest; 4th to the 8th black at the apex; 9th and 10th black, the latter slightly clavate. Eyes deep purple; viewed from above a little more than hemispherical. Ocelli brilliant, red. Thorax: prônotum pale brownish yellow, broadest in the middle, narrow at the sides, and widening out into a small yellow knob; mesonotum brown, slightly hairy, convex; anterior portion (dorsulum) very convex in front, somewhat constricted on the sides; lateral angles produced into a long yellowish spine; disc posteriorly flat, in the middle more or less yellowish or brownish yellow; central portion flat down the middle, with a broad, central, and a more or less distinct, yellow line on each side; scutellar or apical portion yellowish; anterior margin concave; angles acute. Elytra clear, transparent; length about two and a quarter times that of the breadth, broadly rounded at the apex; nerves fine, black or

brownish black; marginal nerve fuscous or fuscous-brown; base with a lozenge-shaped dark fuscous or black patch, and a very narrow ⟨/-shaped deep black band across the inner marginal nerves of the basal cells; apices of the costal and dorsal cells almost in a line with each other; radius very wide at the base, almost touching the upper arm of the cubitus, becoming convex towards the costal margin from before the middle, and joins the costal (post-costal) nerve just before reaching the apex; stem (vena ulnaris) slightly curved after leaving the base; cubitus upper arm long, three times longer than the lower one, convex towards the costal margin; lower arm short, slightly curved towards the base; inner branch a little longer than the arm, curved towards the base; distance between the apices of the two branches about equal to each other; clavus small, narrow; suture very fine, almost imperceptible in certain lights; nervelets distinct, black. Legs brownish yellow, thickly clothed with very short, stiffish, semierect, dark hairs. Thighs: extreme apex on the inside generally with a minute black spot. Tarsi black above, beneath red. Abdomen, ♂, above dark brown; base with a yellowish or brownish yellow patch; genital plate dirty fuscous-white, slightly hairy; viewed from the side, the posterior margin produced into a short black claw or tooth; inner margin widest at the apex, broadly rounded; processes brown, short, stout, clavate, reaching to about one-half the height of the genital plate. Abdomen, ♀, above dark brown, stout, broadly rounded posteriorly; genital plates, viewed from above or beneath, short, thin; viewed from the side, the base not equal to the length; lower plate shorter than the upper one. Length, 1 line (Paris).

This species forms large galls on the shoots and branches of *Sapium aucuparium*, Jacq., var. *salicifolium*, Knth. (= *Excœcaria biglandulosa*, Müll.).

Hab. Buenos Ayres and Uruguay.

XVIII. *On certain genera and species of the group of* Psyllidæ *in the collection of the British Museum.* By John Scott.

[Read July 5th, 1882.]

Plates XVIII., XIX.

In the following pages I have set myself the task of attempting to clear away the cloud which for a long time has hung over and obscured in doubt certain members of this group in the National Collection. For some years I have been importuned, by my friends on the Continent especially, to examine and report upon them, but an opportunity has not previously presented itself to permit of my doing so thoroughly. At last I have concluded the work, and the result will be found in the addition of some new genera, which was to be anticipated after a searching investigation. Things had somehow or other got terribly "mixed," as the saying is, and I would that "he had avoided *Psylla*," and thus have prevented the difficulties experienced in recognising any of the insects by the descriptions given. The genera also to which they had been assigned, as will be seen hereafter, only made "confusion worse confounded," and no wonder therefore that those who were paying attention to, and interesting themselves about, the group should desire anxiously to know whether any new forms or additional subfamilies or genera were to be added to our present knowledge of these insects. What we have hitherto known about them has been almost entirely confined to European species, and I have no doubt that careful observation in other countries, judging from what I have now seen, will some day or other show how limited our views of this section of the Homoptera at present are. I would also impress upon collectors in other lands the necessity for ascertaining their life-history—whether they roll up a leaf, or make galls thereon; or whether they attack the shoots and branches of trees or shrubs, and how such attacks are made manifest; and with this advice I now proceed to the completion of my work.

APHALARINÆ.

THEA,* n. g.

Caput inter oculos longitudine sua media duplo latius. Verticis margo posterior tantum non rectus; latera ejus recta a basi usque ad oculorum angulos anticos, ubi in dentem brevem crassum triangulum sunt producta; deinde ab horum angulo-interiore basali ad marginem anteriorem continuata; margo anterior longitudine media vix latior, subconcavus, vel angulatus; anguli anguste rotundati. Lobi faciales angusti, tæniiformes. Antennarum articuli primus et secundus breves, crassi; tertius quartum versus attenuatus, hic sexta fere parte longior quam ille; articuli octavus, nonus, decimus, carent. Oculi laterales, latitudine fere tota ultra pronotum exstantes. Ocelli tres. Thorax: pronotum angustum.. Mesonotum convexum, latitudo ejus juxta elytrorum insertionem capitis cum oculis latitudini fere æqualis. Elytra elongata, apice acuta; stigma breve; radius longus, apice ipso terminatus; cubiti furca superior brachio longior; petiolus brachio inferiore paulo longior.

Head twice as broad between the eyes as the length down the centre. Crown: posterior margin almost straight; sides straight from the base to the front of the eyes, where they are produced into a short, stout, triangular tooth, then continued from the inner angle of the base of the latter to the junction with the anterior margin; anterior margin scarcely as broad as the length down the centre, slightly concave or angulate; angles narrowly rounded. Face lobes narrow, ribbon-shaped. Antennæ: 1st and 2nd joints short, stout; third tapering to the fourth, the latter about one-sixth longer than the former; 8, 9, 10 joints wanting. Eyes placed on the sides of the head, projecting nearly their whole width beyond the pronotum. Ocelli three. Thorax: pronotum narrow; mesonotum convex, breadth across the insertion of the elytra about equal to that of the head and eyes together. Elytra elongate, apex acute; stigma short; radius long, terminating in the apex; cubitus, upper furcation longer than the arm; petiole a little longer than the lower arm.

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* Titanidis nomen.

Thea trigutta. (Pl. XVIII., figs. 3—3*d*).

Psylla trigutta, Walker, Ins. Saund., Hom., p. 111.

♀. Sordide pallido-flava, rubro vel fusco-rufo plus minus suffusa. Caput: vertex sordide pallido-flavus, medio nonnihil subrufescens, maculis paucis minutis fusco-rufis; latitudo ejus inter oculos longitudine media duplo major; margo posterior tantum non rectus; latera in dentem brevem crassum triangulum ante oculos producta; margo anterior subconcavus vel angulatus, angulis rotundatis, verticis longitudini mediæ vix latitudine æqualis; discus subexplanatus, præter margines concavus, paulo intra marginem anteriorem terminatus, qui tanquam subincrassatus videtur. Lobi faciales pallide flavido-albi, tæniiformes, utriusque latitudo longitudini dimidiæ fere æqualis. Antennæ rufescenti-flavæ; articuli primus et secundus crussi, rufi; tertius cæteris crassior, a basi in apicem subattenuatus; quartus sextu fere parte longior quam tertius; quintus, sextus, septimus, subæquales, præter quinti basin leviter infuscati; octavus, nonus, decimus, carent. Ocelli tres; anticus desuper visu difficilimus. Thorax: pronotum sordide pallido-flavum, subrufescens, angustum, canalicula transversa fere integra; margines laterales eadem fere linea cum oculorum margine interiore terminati; margo anterior convexus, posterior rectus. Mesonotum convexum, sordide pallido-flavum, subrufescens; latitudo ejus apud elytrorum insertionem vix capitis cum oculis latitudini æqualis; regio scutellaris flava. Elytra elongata, apice acuta, lucida, fere hyalina, latitudine sua circiter triplo longiora; cellulæ costalis basalis nervus marginalis interior flavescens, apice nigro; stigma basi latum, longitudo ejus (secundum nervum marginalem emensa) distantiæ suæ ab apice (pari modo emensæ) fere æqualis; radius longus, apice ipso terminatus, costam versus ubique, nisi basi, convexus; nervi cubitales basi nigri, ultra furcas rufi; furcæ superioris brachium furcæ ipsi per medium emensæ vix longitudine æquale; petiolus brachio inferiore paulo longior; distantia inter brachii inferioris ramorum apices petiolo fere longitudine æqualis; apicem ambit vitta lata fusca, ad marginem costalem latissima, furcæ dorsalis albo vel pallido trimaculatæ paulo ante nervum interiorem disincus, maculis furcarum cubitalium nervos circumstantibus.

♀. Abdomen nigrum, segmentorum marginibus posticis anguste rufis; genitalia præter exiguam baseos particulam, abrupta, unde fit ut laminarum mensura æstimari haud queat. Abdomen etiam nimis in rugas dessicatum. Exemplar unicum.

♀. Dirty pale yellow, more or less suffused with reddish or brownish red. Head: crown dirty pale yellow, somewhat reddish in the middle, and with a few minute brownish red spots, twice as broad between the eyes as the length down the centre; posterior margin almost straight; sides produced into a short, stout, triangular tooth in front of the eyes; anterior margin slightly concave or angulate, angles rounded, scarcely as broad as the length down the centre, disc flattish concave, except the margins, terminating a little way within the anterior one, which appears as if slightly thickened. Face lobes pale yellowish white, ribbon-shaped, width equal to about half the length of either. Antennæ reddish yellow; 1st and 2nd joints stout, red; 3rd stouter than the remainder, slightly tapering from the base to the apex; 4th about one-sixth longer than the 3rd; 5, 6, 7 subequal, slightly fuscous, except the base of the 5th; 8, 9, 10 wanting. Ocelli three, the frontal one scarcely visible from above. Thorax: pronotum dirty pale yellow, with a reddish tinge, narrow, with a transverse channel almost extending from side to side; lateral margin terminating about in a line with the inner margin of the eyes; anterior margin convex, posterior margin straight; mesonotum convex, dirty pale yellow, suffused with reddish; width across the insertion of the elytra scarcely so great as the head and eyes together; scutellar portion yellow. Elytra elongate, apex acute, clear, almost transparent; length about three times greater than the breadth; inner marginal nerve of the costal basal cell yellowish; apex black; stigma wide at its base; length, measured on the marginal nerve, about equal to the distance from the apex, measured similarly; radius long, terminating in the apex, convex towards the costal margin throughout its whole length, except at the base; cubital nerves black at the base, from the furcations red; arm of the upper furcation scarcely as long as the furcation measured through the centre; petiole a little longer than the lower arm; distance between the apices of the branches of the lower arm about equal to the length of the petiole; round the apex a broad brown band, broadest on the os

margin, terminating a little before the inner nerve of the dorsal fork, in which are three white or pale spots encircling the nerves of the furcations of the cubitus.

♀. Abdomen black; posterior margin of the segments narrowly red; genitalia broken off, except a small portion of the base, so that it is impossible to determine the length of the plates. The abdomen is also very much shrivelled. Length, 4 lines nearly (Paris).

Locality unknown.

There is only a single specimen.

Phytolyma,* n. g.

Caput: vertex oblongus, transversus, deplanatus, margine posteriore angulato, anteriore bilobo. Lobi faciales breves, lunati, seu tæniiformes. Antennæ breves, clavatæ; articuli primus et secundus crassi, ille hoc multo longior. Oculi laterales, a fronte visi semiglobosi. Thorax: pronotum capiti una cum oculis latitudine æquale, in medio latissimum. Mesonotum longitudinaliter planiusculum, transverse convexiusculum, apud elytrorum insertionem latissimum; dorsulum transversum, plus minus semisexangulum. Elytra elongata, apice rotundata; stigma productum; radius apice ipso vel prope apicem terminatus; cubitus petiolatus; furca superior elongata, angusta, elytri saltem trientem longitudine adæquans; furcæ inferioris brachium petiolo brevius; furca inferior elongata: distantia inter ramorum apices major quam in furca superiore. Abdomen plus minus obesum.

Head: crown oblong, transverse, flat; posterior margin angulate; anterior margin bilobate. Face lobes short, lunate, or ribbon-shaped. Antennæ short, clavate: 1st and 2nd joints stout, the former much longer than the latter. Eyes placed on the side of the head, viewed from in front hemispherical. Thorax: pronotum as wide as the head and eyes together, broadest in the middle; mesonotum flattish longitudinally, slightly convex transversely; greatest width across the insertion of the elytra; dorsulum transverse, more or less semihexagonal. Elytra elongate, rounded at the apex;

* φυτόν, a plant; λύμη, injury.

stigma elongate; radius terminating in or near the apex; cubitus petiolate; upper furcation long, narrow, equal to at least one-third the length of the elytron; arm of the lower furcation shorter than the petiole; lower furcation elongate; distance between the apices of the branches greater than that of the upper furcation. Abdomen more or less obese.

Phytolyma lata. (Pl. XVIII., figs. 4—4*f*).

Psylla? lata, Walker, List Hom., B. M., part 4, p. 294.

Viridula. Caput fere in perpendiculum deflexum. Vertex oblongus, transversus, flavidus, punctulatissimus; longitudo ejus media dimidio inter oculos spatio major; margo posterior angulatus, anterior bilobus; discus prope basin utrinque fovea in commatis formam impressa. Lobi faciales perbreves, sublunati, pallide flavido-albi. Antennæ breves, clavatæ, pallide flavescentes; articulus primus cæteris crassior, duplo et dimidio longior quam secundus; tertius, quartus, sextus subæquales; quintus tertio triente brevior; septimus tenuis, cylindricus, sexto fere æqualis; octavus late ovatus; nonus pateriformis; decimus minutus; articulis tres apicales nigri. Oculi laterales; desuper conspecti globoso-trianguli; a fronte visi pæne semiglobosi. Thorax: pronotum virescens, capiti una cum oculis latitudine æquale; latitudo ejus media verticis latitudini dimidiæ fere æqualis; margo anterior convexiusculus, posterior vix nisi rectus; discus foveola media, binisque utrinque lateralibus, quarum interiores in eadem linea cum oculorum margine interno jacent; mesonotum in longitudinem planiusculum, transverse convexiusculum, apud elytrorum insertionem latissimum; dorsulum transversum, semisexangulum, viride, margine antico anguste rufo-fusco; spatium centrale rufo-fuscum, antice viride. Elytra clare pellucida, transverse rugulosa; longitudo quadrante minor quam latitudo triplex; nervi albi, maculis elongatis, nigris, inæqualibus, obsessi; stigma costæ partem basalem longitudine fere adæquans; radius productus, apice ipso terminatus; cubitis petiolus furcæ superioris brachii longitudini dimidiæ fere æqualis; furca superior elongata, angusta; longitudo ejus media elytri triente paulo major; furcæ inferioris brachium petiolo dimidiato brevius; furca inferior elongata; ramus superior sinuatus, in-

ferior vix nisi rectus; distantia inter furcæ superioris ramos eadem quæ ramum superiorem (secundum nervum marginalem) a radii apice distinet; distantia inter furcæ inferioris ramos areæ proximæ margine infero duplo longior. Abdomen superne viridulum, obesum; segmenta duo basalia superne flavida seu rufescentia; segmentorum singulorum latera macula triangula subirregulari, nigra, notata; margines postici anguste nigri.

Pale green. Head deflected almost perpendicular to the body. Crown oblong, transverse, yellowish, thickly and finely punctured; length down the centre greater than half the width between the eyes; posterior margin angulate; anterior margin bilobate; disc with a comma-shaped fovea on each side towards the base. Face lobes very short, slightly lunate, pale yellowish white. Antennæ short, clavate, pale yellowish; 1st joint stoutest, two and a half times longer than the 2nd; 3rd, 4th, and 6th subequal; 5th two-thirds the length of the 3rd; 7th thin, cylindrical, nearly as long as the 6th; 8th broad oval; 9th cup-shaped; 10th minute; three terminal joints black. Eyes placed on the side of the head; viewed from above spherical triangular, from in front almost hemispherical. Thorax: pronotum greenish, as wide as the head and eyes together, breadth, in the middle, nearly equal to half the width of the crown; anterior margin slightly convex; posterior margin nearly straight; centre of the disc with a small fovea and two others on each side, the inner ones in a line with the inner margin of the eyes; mesonotum longitudinally flattish; transversely slightly convex; greatest breadth across the insertion of the elytra; dorsulum transverse, semisexangular, green, anterior margin narrowly reddish brown; central portion reddish brown, anteriorly green. Elytra clear, transparent, finely wrinkled transversely; length two and three-quarter times that of the breadth; nerves white, covered with elongate black spots, unequal in size; stigma nearly as long as the basal costal portion of the marginal nerve; radius elongate, terminating in the apex; cubitus petiole about half the length of the arm of the upper furcation; upper furcation long, narrow, measured down the centre a little greater than one-third the length of the elytron; arm of the lower furcation less than half the length of the petiole; lower furcation elongate; upper branch waved, lower branch almost straight; distance between the

branches of the upper furcation and between the upper branch and the apex of the radius (measured on the marginal nerve) equal; distance between the branches of the lower furcation twice as great as that of the adjoining area measured in a similar manner. Abdomen above pale green, obese; two basal segments above yellowish, or with a reddish tinge; sides with a somewhat irregular, triangular black patch on each segment; posterior margin of the segments narrowly black. Length, $1\frac{3}{4}$ line (Paris).

Hab. Sierra Leone.

The collection possesses three specimens, one of which is on a small portion of a leaf of some tree or shrub having two somewhat large circular galls on its upper side, which, I presume, were caused by *P. lata*.

PHYLLOLYMA,* n. g.

Caput: vertex latus; longitudo media dimidio inter oculos spatio fere æqualis. Lobi faciales angusti tæniiformes. Antennæ breves; articuli primus et secundus crassi; tertius etc. ad decimum usque, filiformes. Oculi sat magni, laterales; utriusque margo internus (quoad dimidium suum inferius) a verticis latere laminata lunata seu cuneata sejunctus. Thorax: pronotum angustum, convexum, lateribus rotundatis, oculorum marginis postici vix ultra medium extensis; mesonotum apud elytrorum insertionem capite una cum oculis haud latius; dorsulum transversum, semisexangulum. Elytra rhomboidalia; stigma apice latum; radius apicis angulo superiore terminatus; petiolus cubitalis brachio superiore brevior, inferiore longior.

Head. Crown broad; length down the centre about equal to half the width between the eyes. Face lobes narrow, ribbon-shaped. Antennæ short; 1st and 2nd joints stout; 3—10 filiform. Eyes moderately large, placed on the side of the head; inner margin separated from the lateral margins of the crown on its lower half by a lunate or cuneate plate. Thorax: pronotum narrow, convex; lateral margins rounded, scarcely reaching beyond the middle of the posterior margin of the eyes; mesonotum, across the insertion of the elytra, not wider

* φύλλον, a leaf; λύμη, injury.

than the head and eyes together; dorsulum transverse, semihexagonal. Elytra rhomboidal; stigma wide at the mouth; radius terminating in the upper apical angle; cubitus petiole shorter than the upper arm, longer than the lower one.

Phyllolyma fracticosta. (Pl. XVIII., figs. 5—5*e*).

Psylla fracticosta, Walker, List Hom., B. M., Suppl., p. 275.

♀. Pallide fusca. Caput fere ad perpendiculum deflexum. Vertex antice flavus, basi obscurior et quasi subvirescens, subtilissime punctulatus, longitudine media dimidium inter oculos distintiam fere æquans; discus utrinque profunde quadrifariam punctatus, punctis quodammodo literam W referentibus; margo posterior concavus, anterior bilobus. Lobi faciales albi, tæniiformes. Antennæ breves, flavæ; articuli primus et secundus crassi, fuscescentes; secundus tertio vix brevior; quartus et quintus fere æquales, uterque triente brevior quam tertius; sextus, septimus, octavus, subæquales, apice late fusci; nonus præcedentibus longior, præter basin saturate fuscus; decimus minutus, niger. Oculi fuscescentes, laterales, desuper et a fronte irsi sphericotrianguli; a latere conspecti reniformes; marginis interni dimidium inferius a verticis margine laterali lamina pallida lunata vel cuneata sejunctum. Ocelli rufi; anticus desuper haud conspiciendus. Thorax: pronotum flavum, angustum, convexum, medio subcœrulescens vel subvirescens, lateribus oculorum marginem exteriorem haud attingens; margo ejus anterior lateribus nonnihil concavus; margines laterales rotundatus, fovea nigra paulo intra angulum utrinque impressus; mesonotum flavum, convexum, apud elytrorum insertionem capite una cum oculis haud latius; dorsulum transversum, semisexangulum, utrinque macula subocellata prope medium antice notatum; spatium centrale flavidum, lateribus juxta elytrorum insertionem infuscatum. Elytra rhomboidalia, pallide fusca, transversim rugosa. Clavus pallide fuscus, area nervo marginali nervoque clavali interclusa, candida; costæ cellula basalis canalicula profunda, angusta, alba, quæ postquam venæ ulnaris oram interiorem fere ad apicem raserit, hinc cursu diagonali cellulam traducta nervo marginali ad stigmatis basin terminatur; stigma breve, basi latum, nervo albente;

radius elongatus, in apicis angulum superiorem evectus ; nervus albus, tantum non rectus ; cubiti petiolus brachio superiore fere triente brevior, inferiore dimidio fere longior ; furca superior longitudine media brachii dimidium ferme æquans ; furcæ inferioris ramus superior basi cubito curvatus ; distantia inter ramorum apices (per nervum marginalem emensa) brachio longitudine æqualis ; discus stria subobliqua, irregulari, lata, alba, quæ a costæ margine orta stigma dividit, deinde in brachii cubitalis inferioris ramo superiore exitum habet ; apicem ambit stria latiuscula, alba, a radio extremo rami superioris brachii cubitalis inferioris ad apicem usque extensa ; nervus dorsalis marginalis fere a suturæ clavalis apice obscure fuscus, præter loca ubi ramorum nervi candidi fuscedinem apicibus suis interrumpunt. Pedes pallide flavi. Abdomine piceo-fuscum, nitidum.

♀. Pale fuscous-brown. Head deflected almost perpendicularly. Crown yellow in front ; base with a darker, somewhat greenish, tinge, very finely punctured ; length down the centre about equal to half the breadth between the eyes ; disc with four deep punctures on either side, forming a somewhat W-shaped character ; posterior margin concave ; anterior margin bilobate. Face lobes white, ribbon-shaped. Antennæ short, yellow ; 1st and 2nd joints stout, brownish ; 2nd almost as long as the 3rd ; 4th and 5th about equal, each one-third shorter than the 3rd ; 6th, 7th, and 8th subequal, broadly fuscous at the apex ; 9th longer than any of the former, dark fuscous, except the base ; 10th minute, black. Eyes somewhat fuscous-brown, placed on the side of the head, viewed from above and in front spherical-triangular, from the side reniform ; inner margin separated from the lateral margin of the crown on its lower half by a pale, lunate, or cuneate plate. Ocelli red, frontal one not visible from above. Thorax : pronotum yellow, narrow, convex, somewhat bluish or greenish in the middle, not reaching to the outer margin of the eyes ; anterior margin slightly concave on the sides ; lateral margins rounded, with a black fovea a little way within each ; mesonotum yellow, convex, not wider across the insertion of the elytra than the head and eyes together ; dorsulum transverse, semihexagonal, with a somewhat ocellate spot in front on each side of the middle, central portion yellow, brown on the sides next the insertion of the elytra. Elytra rhomboidal, pale fuscous-brown, transversely

wrinkled. Clavus pale fuscous-brown ; area enclosed between the marginal and claval nerves white ; costal basal cell with a deep, narrow, white channel running along the inner margin of the stem (vena ulnaris) to near its apex, then crossing the cell diagonally and terminating in the marginal nerve at the base of the stigma ; stigma short, wide at its base, nerve white ; radius long, terminating in the upper apical angle ; nerve white, almost straight ; cubitus petiole about two-thirds the length of the upper arm, and about one and a half time the length of the lower one ; upper furcation, measured down the middle, about half the length of the arm ; lower furcation, upper branch abruptly curved at the base ; distance between the apices of the branches, measured on the marginal nerve, equal to the length of the arm ; disc with a slightly oblique, irregular, broad, white streak extending from the costal margin across the stigma and terminating at the upper branch of the lower arm of the cubitus ; round the apex a somewhat broad white stripe extending from the apex of the radius to the apex of the upper branch of the lower arm of the cubitus ; dorsal marginal nerve from within the apex of the claval suture dark fuscous, except where interrupted by the apices of the white nerves of the branches. Legs pale yellow. Abdomen pitchy brown, shining, Length, $1\frac{3}{4}$ line (Paris).

Psylla arctica. (Pl. XIX., figs. 1—1*d*).

Aphalara arctica, Walker, List Hom., B. M., part 4, p. 931.

The above is a true *Psylla*. There are three specimens (females) on one pin in the collection. I have given a figure of some of the principal parts, which may be of use to collectors in the far north some day.

TRIOZINÆ.

PETALOLYMA,* n. g.

Caput : vertex, medio emensus, dimidio oculorum intervallo paulo longior. Lobi faciales elongati. Antennæ breves, et, præter baseos articulos duo crassos, filiformes ; articulus tertius quarto longior. Oculi laterales. Thorax : pronotum angustum, lateribus non ultra oculorum mar-

* πέταλον, a leaf ; λύμη, injury.

ginem externum productis ; mesonotum apud elytrorum insertionem, capite cum oculis latius. Elytra elongata, nervulis ternis instructa, apice plus minus late rotundata ; radius elongatus ; costæ cellula basalis dorsali minor ; cubiti brachium superius inferiore multo longius.

Head : crown, measured down the centre, a little greater than half the width between the eyes. Face lobes long. Antennæ short, filiform, except the two basal joints, which are stout ; 3rd joint longer than the 4th. Eyes placed on the sides of the head. Thorax : pronotum narrow ; lateral margins not reaching beyond the outer margin of the eyes ; mesonotum, across the insertion of the elytra, wider than the head and eyes together. Elytra elongate, with three nervelets ; apex more or less broadly rounded ; radius long ; costal basal cell smaller than the dorsal one ; cubitus upper arm much longer than the lower one.

Petalolyma basalis. (Pl. XIX., figs. 2—2*f*).

Psylla basalis, Walker, List Hom., B. M., Supp., p. 275.

Mas niger, opacus, pilis longis flavis dense vestitus. Caput deflexum, angulum cum corpore fere rectum fingens. Vertex piceo-fuscus, nitidiusculus, flavo-pilosus ; longitudo media dimidio oculorum intervallo paulo major ; margo posticus prope medium utrinque convexiusculus ; margo anticus rectus ; discus depressus, utrinque foveatus. Lobi faciales elongati, conici, vertici per medium emenso longitudine æquales, non nisi apice divaricantes, nigri, opaci, pilis longis semierectis flavis dense obtecti ; margo interior, a latere conspectus, convexus ; exterior concavus ; apex rotundatus, subflavescens. Antennæ flavæ, breves, et, præter articulos duo basales, filiformes, capite una cum lobis facialibus circiter duplo longiores ; articulus tertius quarto fere duplo longior ; nonus decimusque nigri. Oculi a fronte visi, semiglobosi ; a latere, ovali. Thorax : pronotum angustum, nigrum, lateribus paulo ultra verticem exstantibus ; mesonotum convexum, nigrum, opacum, flavo-pilosum, apud elytrorum insertionem capite cum oculis paulo latius. Elytra clare hyalina, quarta fere parte breviora quam latitudo sua triplex, apice rotundata ; costæ cellula basalis brevis, per medium emensa dimidio radio fere longitudine æqualis ; radius elongatus, apice ipso terminatus ; cubiti

brachium superius subincurvatum, inferiore fere duplo longius; furca superior elongata, per medium emensa dimidio brachio longior; brachium inferius cum furcæ ramis literam-**h** quodammodo refert; distantia inter ramorum apices (secundum nervum marginalem emensa) utrique furcæ eadem; nervus marginalis dorsalis basi pilorum longorum crassorum ordine instructus; radii basin vitta transversa, irregularis, nigra, in disco transit. Abdomen nigrum vel piceo-nigrum, genitalibus concoloribus, inferne breviter flavo-pilosis.

♂. Black, dull, thickly clothed with long yellow hairs. Head deflected almost perpendicular to the body. Crown pitchy brown, slightly shining, clothed with yellow hairs; length down the centre a little greater than half the width between the eyes; posterior margin slightly convex on each side of the centre; anterior margin straight; disc depressed, with a fovea on each side. Face lobes long, conical, as long as the crown measured down the centre; non-divergent, except at the apex; black, dull, thickly clothed with long, semierect, yellow hairs; viewed from the side, inner margin convex, outer margin concave; apex rounded, somewhat yellow. Antennæ yellow; short, filiform, except the two basal joints; about twice the length of the head and face lobes together; 3rd joint almost twice as long as the 4th; 9th and 10th black. Eyes, viewed from in front hemispherical, from the side oval. Thorax: pronotum narrow, black; lateral margins a little wider than the crown; mesonotum convex, black, dull, clothed with yellow hairs; across the insertion of the elytra a little wider than the head and eyes together. Elytra clear, transparent; about two and three-quarter times as long as broad; apex rounded; costal basal cell short, measured through the centre about half the length of the radius; radius long, terminating in the apex; upper arm of the cubitus slightly curved, nearly twice the length of the lower arm; upper furcation long, measured through the centre greater than half the length of the arm; lower arm and branches of the furcation form an **h**-shaped character; distance between the apices of the branches of the upper and lower furcations equal to one another when measured on the marginal nerve; dorsal marginal nerve at the base with a row of long, stout hairs; disc with a transverse, irregular, black band across the base of the radius. Abdomen black or pitchy black; genitalia black or pitchy

black; underneath clothed with short yellow hairs. Length, 2 lines (Paris).

Hab. N. India.

LIVILLINÆ.

Caput cum oculis pronoto latius, mesonoto juxta elytrorum insertionem aut latitudine æquale, aut eodem latius. Vertex latior quam longior. Lobi faciales variiformes modo longiores vertice, modo breviores. Antennæ longæ, filiformes. Oculi desuper visi semiglobosi, laterales. Pronotum angustum, utrinque intra margines laterales fovea aut punctura parva impressum; mesonotum modice convexum; dorsulum irregulariter hexagonum. Elytra coriacea, plus minus lata seu elongata, stigmate vel instructa vel privata; cubiti petiolus furcæ inferiores brachio aut brevior aut longior, aut denique eidem æqualis; furca superior elongata, angusta, elytri saltem decumas quatuor longitudine adæquans; ramus superior apice ipso terminatus; furcæ inferioris ramus superior elongatus, inferiore plus duplo longior.

Head, together with the eyes, wider than the pronotum, as wide or wider than the mesonotum measured across the insertion of the elytra. Crown broader than long. Face lobes variform, longer or shorter than the crown. Antennæ long, filiform. Eyes, viewed from above, hemispherical, placed on the sides of the head. Pronotum narrow, with a small fovea or puncture within the lateral margin; mesonotum moderately convex; dorsulum irregularly hexagonal. Elytra coriaceous, more or less broad or elongate, with or without a stigma; petiole of the cubitus shorter, as long as or longer than the arm of the lower furcation; upper furcation long, narrow, at least two-fifths the length of the elytron; upper branch terminating in the apex; lower furcation, upper branch long, more than twice the length of the lower one.

Creiis,* n. g.

Caput: verticis longitudo media spatio inter oculos dimidio latior; margo lateralis ante oculum utrumque in dentem brevem angularem productus; margo anterior plus minus concavus. Lobi faciales porrecti, crassi,

* Titanis cujusdam nomen.

nonnihil vesicati. Antennæ longæ, filiformes; articuli primus et secundus crassi; tertius longissimus; quartus ad octavum usque longitudine fere æquales; nonus præcedente brevior; decimus subfusiformis. Oculis desuper visi semiglobosi, laterales. Thorax: pronotum angustum, ad margines laterales latissimum, prope quos fovea parva sive punctura cernenda; mesonotum modice convexum; dorsulum irregulare, hexagonum. Elytra elongata, apice rotundata; stigma elongatum; radius nervo marginali ante apicem incurrens; cubiti furcæ elongatæ.

Head: crown down the centre more than half the breadth between the eyes; lateral margin in front of each eye produced into a short angular tooth; anterior margin more or less concave. Face lobes long, stout, somewhat vesicate. Antennæ long, filiform; 1st and 2nd joints stout; 3rd longest; 4—8 almost of equal length; 9th shorter than the former; 10th slightly fusiform. Eyes, viewed from above, hemispherical, placed on the sides of the head. Thorax: pronotum narrow, widest at the lateral margins, within which is a small fovea or puncture; mesonotum moderately convex; dorsulum of an irregular hexagonal shape. Elytra elongate, rounded at the apex; stigma elongate; radius joining the marginal nerve before the apex; cubitus furcations elongate.

Creiis longipennis. (Pl. XIX., figs. 3—3*c*').

Livia longipennis, Walker, List Hom., B. M., part 4, p. 910, ♂.

Psylla livioides, Walker, Ins. Saund. Hom., p. 111, ♀.

Rufus. Caput deflexum, angulum cum corpore sat magnum fingens. Vertex rufus; longitudo media dimidio inter oculos spatio longior, canalicula diagonali utrumque in medium ducta; margo lateralis ante oculum utrinque in dentem brevem, angularem, productus; margo posterior concavus, externe rotundatus; margo anterior angulatus. Lobi faciales rufi, elongati, crassi, nonnihil vesiciformes, marginibus internus ante apicem haud divaricantibus, pilis longiusculis tenuibus, sericis, albis, dense obsiti. Antennæ rufæ, filiformes, pilis tenuibus, suberectis, parcius vestitæ; articuli primus et secundus breves, crassi; primus secundo duplo crassior et fere sesqui longior; tertius longissimus, tertia parte longior quam quartus; articuli quartus etc. ad octavum longitudine pæne

æquales; nonus ultimo fusiformi, nigro, plus duplo longior. Oculi a fronte visi fere semiglobosi; a latere, obtusi, reniformes. Thorax: pronotum rufum, angustum, lateribus paulo latius; mesonotum rufum, sat convexum; dorsulum irregulare, sexangulum, latius quam longius; spatium centrale rufum, convexum; regio scutellaris rufa. Elytra fusca, coriacea, nitida, subtiliter et irregulariter transverse rugulosa, elongata, apice anguste rotundata, triplo longiora quam latiora, nervis rufis; costa a basi fere ad stigma nonnihil reflexa; stigma elongatum, paulo ante radii apicem terminatum, rufum, lineolis subtilibus, irregularibus, albis, numerosis, transverse intersectum; radius ab ortu fere ad apicem costam versus subincurvatus, prope apicem vero subito conversus, nervo marginali paulo ante stigmatis apicem incurrit; petiolus cubitalis, brachium, furcæ inferioris ramus interior, longitudine fere inter se æqualia; furca superior, elongata, angusta, elytri decumas quatuor longitudine paulo exsuperans; ramus superior apice ipso terminatus, inferior marginem dorsalem versus maximam partem incurvatus, dein subito retortus, in eadem fere linea cum radii apice nervo marginali conjungitur; furcæ inferioris ramus interior vix nisi rectus; ramus exterior basi convexus, inde usque sub ipsum apicem concavus; distantia inter ramorum bifurcorum apices (secundum nervum marginalem emensa), duplo major quam furcæ superioris idem intervallum. Pedes rufi, femoribus posticis flavescentibus. Abdomen superne rufum, segmentorum quatuor vel quinque marginibus nigrantibus; inferne flavidum.

Inepta sunt quæ vir cl. Walker in descriptione sua de elytrorum striis vel maculis albis ægre cernendis effutivit, quippe quæ non nisi luminis in superficiem salebrosam et huc illuc manu commotam incidentis ope efficiantur.

Head deflected, forming a considerable angle with the body. Crown red; length down the centre greater than half the breadth between the eyes, with a diagonal channel on each side running towards the centre; lateral margin in front of each eye produced into a short, angular tooth; posterior margin concave, rounded externally; anterior margin angulate. Face lobes red, long, stout, somewhat bladder-shaped, their inner margins not diverging until reaching the apex, thickly clothed with longish, fine, silky white hairs. Antennæ red, filiform,

sparingly clothed with fine, almost erect, hairs; 1st and 2nd joints short, stout; 1st twice as stout as the 2nd, and about one-half longer; 3rd longest, one-third longer than the 4th; 4—8 almost equal in length; 9th more than twice the length of the fusiform, black, terminal one. Eyes, viewed from in front, almost hemispherical, from the side obtuse-reniform. Thorax: pronotum red, narrow, slightly widest at the lateral margins; mesonotum red, moderately convex; dorsulum of an irregular hexagonal form; anterior and posterior sides greatest, central portion red, convex, scutellar portion red. Elytra brown, coriaceous, shining, finely but irregularly wrinkled transversely, elongate, narrowly rounded at the apex, three times as long as broad; nerves red; costal margin somewhat reflexed from the base almost to the stigma; stigma elongate, terminating a little way before the apex of the radius, red, thickly interrupted transversely by fine, irregular, white lines; radius slightly curving towards the costal margin throughout its entire length until approaching its extremity, when it bends suddenly round and joins the marginal nerve a little way in front of the apex of the stigma; cubitus petiole, arm and inner branch of the lower furcation almost equal to each other in length; upper furcation long, narrow, a little more than two-fifths the length of the elytron; upper branch terminating in the apex; lower branch curving towards the dorsal margin for the greater part of its length, then suddenly bending round and joining the marginal nerve about in a line with the apex of the radius; lower furcation, inner branch nearly straight, outer branch convex at the base, then concave to within a little way of the apex; distance between the apices of the branches of the furcation, measured on the marginal nerve, twice as great as that between the apices of the branches of the upper furcation. Legs red. Thighs: 3rd pair yellowish. Abdomen above red; anterior margin of 4 or 5 segments black; below yellowish. Length, $3\frac{1}{2}$ lines (Paris).

Mr. Walker's remark, in his description, on the "scarcely visible white dashes or spots" on the elytra is imaginary, as they are simply caused by the light falling on the uneven surface when moved to and fro.

Hab. ♂, Tasmania; ♀, unknown.

There are only two specimens in the British Museum

collection (♂ and ♀) described under the names given above.

PRIONOCNEMIDÆ.*

Caput parvum. Vertex, medio emensus, spatio inter oculos dimidio longitudine plus minus æqualis. Lobi faciales breves. Antennæ longæ, et, præter articulos duo breves baseos, filiformes. Oculi laterales desuper visi laminæ plus minus triangulæ seu cuneiformis margini interiori postice innixi. Pronotum angustum, medio latissimum, latera ejus fovea intus impressa, et in eadem fere linea cum oculorum margine externo directa. Mesonotum convexum, apud elytrorum insertionem capite una cum oculis latius. Elytra elongata, apice plus minus acuta, stigmate instructa; cubiti petiolus brevis; nervuli marginales bini seu quaterni. Pedes: tibiæ posticæ denticulo brevi, crasso, hamato, angulari, basi armatæ, apice dilatatæ, plus minus profunde serratæ.

Head small. Crown, measured down the centre, more or less than half the width between the eyes. Face lobes short. Antennæ long, filiform, except the two short, stout, basal joints. Eyes placed on the sides of the head, posteriorly, as seen from above, resting against the inner margin of a more or less triangular or cuneate-shaped plate. Pronotum narrow, broadest in the middle; lateral margins about in a line with the outer margin of the eyes, and with a fovea within the former; mesonotum convex, wider across the insertion of the elytra than the head and eyes together. Elytra elongate, more or less acute at the apex; with a stigma; cubitus petiole short; margin with two or four nervelets. Legs: tibiæ, 3rd pair with a short, stout, curved, angular tooth at the base; apex dilated, and with a more or less serrated margin.

CARSIDARA, *Walk.*†

Caput parvum. Vertex, medio emensus, oculorum intervallo brevior. Lobi faciales breves, desuper occulti. Antennæ longæ, filiformes, articulis duobus basalibus brevibus, crassis. Oculi laterales, desuper visi laminæ triangulæ vel cuneiformis margini interno postici innixi.

* Πρίων, a saw; κνήμη, the tibia.

† Vox et præteria nihil. A thing of sound and ——— signifying nothing.

Thorax: pronotum angustum, ad latera utrinque foveatum. Mesonotum convexum, apud elytrorum insertionem latissimum. Elytra elongata, apice acuta; stigma et radius perbrevia; cubiti petiolus brevis; furcæ superioris brachium elongatum, area inter ramos amplissima; margo dorsalis nervulis binis. Pedes: tibiæ posticæ denticulo brevi, crasso, hamato, angulari, basi armatæ, apice dilatatæ, ex parte serratæ.

Head small. Crown, measured down the centre, less than the width between the eyes. Face lobes short, not visible from above. Antennæ long, filiform, two basal joints short, stout. Eyes placed on the sides of the head, posteriorly, as seen from above, resting against the inner margin of a triangular or cuneate-shaped plate. Thorax: pronotum narrow, with a fovea on each side near the lateral margins; mesonotum convex; greatest breadth across the insertion of the elytra. Elytra elongate, acute at the apex; stigma and radius very short; cubitus petiole short; arm of the upper furcation long; area enclosed between the branches very large; dorsal margin with two nervelets. Legs: tibiæ, 3rd pair with a short, stout, curved, angular tooth at the base; apex dilated, partially serrated.

Carsidara marginalis. (Pl. XIX., figs. 4—4*f*).

Carsidara marginalis, Walker, Journ. Proc. Linn. Soc., vol. x., p. 329.

Fusca, subrufescens. Caput: vertex haud deflexus, sordide flavus, pilis subtillisimis longis vestitus; longitudo ejus media dimidio oculorum intervallo brevior; margines postice et ad latera disco interno altiores; margo posticus angulatus; margo anterior incisuris tribus angularibus, quarum media maxima, laterales supra antennarum basin sitæ sunt, et cum marginum lateralium apicibus angulos fingunt externos, ante oculos utrinque in callum parvum productos, a latere faciliores visu; discus medio bis depressus, canalicula fusca, incisurarum lateralium apicibus terminata, in longitudinem definitus. Lobi faciales pallide flavi, breves, apice rotundati, desuper occulti, pilis longis termibus vestiti. Antennæ flavæ, longæ, filiformes; articuli primus et secundus crassi; primus fere cylindricus, secundo plus duplo longior; tertius quarto paulo longior; quartus

quinto, sextus tertio, æqualis; articuli tertius et cæt. ad octavum, apice nigri; nonus decimusque minuti, nigri. Oculi mediocres, fumoso-cinerei, laterales, in laminam triangulam vel cuneiformem postice innixi, desuper conspecti globoso-triangulari, a fronte vix nisi semiglobosi, a latere late ovati. Ocelli tres, anticus desuper ægerrime cernendus. Thorax: pronotum sordide flavum, angustum, subdeflexum, caput versus canalicula tenui, transversa, utrinque intra margines laterales in foveam fuscam exeunte, instructum; latera in eadem fere linea cum oculorum margine antico directa; margo anterior medio anguste rotundatus, utrinque leviter excisus; margo posterior concavus. Mesonotum fuscum, subrufescens pilis tenuibus, longiusculis, parcius vestitum, in longitudinem planiusculo-convexum, apud elytrorum insertionem capite cum oculis latius; dorsulum linea media, pallida, flava, in longitudinem divisum, juxtaque hanc lineam macula breviuscula ovali notatum; spatium centrale linea pallide flava longitudinali, alteraque utrinque paululum remota insignitum; regio scutellaris pallide flava. Elytra clare pellucida, elongata, apice acuta, tertia parte breviora quam latitudo sua triplex, pone medium latissima; elytri pars superior (linea scilicet a basi ad apicem ducta determinata) inferiore duplo latior; costa a basi ad apicem fortiter convexa, margine ad stigma usque, vel ultra, reflexo; cellula costalis basalis elongata, subangustata, apice ad nervi marginalis medium fere extenso; stigma perbreve, basi et apice nigricantibus; radius brevis, stigmate secundum nervum marginalem emenso vix duplo longior, apice nigricante; petiolus cubitalis brevis, brachii superioris vix nisi recti tertiam circiter partem longitudine adæquans; furca superior maxima, ramo superiore convexo, cum nervo marginali pari fere intervallo ubique currente; basi cum radio nervo tenuissimo transverso connexa; furcæ inferioris brachium elongatum, subincurvatum, petioli circiter duplo longius; furca inferior minima; nervus dorsalis marginalis a medio ad apicem convexus; margo maculis septem sordide flavis, inæqualibus, deformibus, distinctus; nervuli bini, alter in furca superiore, alter in area interfurcali. Pedes pallide flavi. Femora intermedia fusca. Tibiæ posticæ flavæ, breviter pilosæ, denticulo ad basin brevi, hamato, angulari, armatæ; apice dilatatæ, partim serratæ. Abdomen superne fuscum, inferne viridi-flavum; genitalia fusca, basi pilorum

brevium, nitidorum, adpressorum ordine subpectinato, laterali, apice villis pauculis, longis, tenuissimis, erectis, instructa.

Fuscous, with a reddish tinge. Head: crown horizontal, sordid yellow, clothed with very fine, long hairs; length down the centre not so great as half the width between the eyes; posterior and lateral margins higher than the inner portion of the disc; posterior margin angulate; anterior margin with three angular incisions, the central one largest; side ones over the base of the antennæ, the exterior angles formed by their junction with the apex of the lateral margins produced into a small callus in front of the eye, and best visible from the side; disc depressed in the centre, on each side bounded by a fuscous longitudinal channel terminating in the apex of the side incisions. Face lobes pale yellow, short, rounded at the apex, not visible from above, clothed with long, fine hairs. Antennæ yellow, long, filiform; 1st and 2nd joints stout; 1st almost cylindrical, more than twice the length of the 2nd; 3rd a little longer than the 4th; 4th and 5th equal; 6th as long as the 3rd; apices of the 3—8 black; 9 and 10 minute, black. Eyes moderate, smoky grey, placed on the sides of the head; posteriorly resting against a triangular or cuneate-shaped plate; viewed from above spherical-triangular, from in front almost hemispherical, from the side broad oval. Ocelli 3; frontal one scarcely visible from above. Thorax: pronotum sordid yellow, narrow, slightly deflected towards the head with a faint transverse channel terminating on each side in a fuscous fovea within the lateral margins, the latter about in a line with the anterior margin of the eyes; anterior margin slightly emarginate on each side the narrowly rounded centre; posterior margin concave; mesonotum fuscous, with a reddish tinge, sparingly clothed with fine, longish hairs; flattish convex longitudinally; wider than the head and eyes together across the insertion of the elytra; dorsulum with a pale yellow, central, longitudinal line, and a short, somewhat elongate, oval patch on each side adjoining the same; central portion with a pale yellow central longitudinal line, and another on each side somewhat remote; scutellar portion pale yellow. Elytra clear, transparent, elongate; apex acute; $2\frac{2}{3}$ times greater than the breadth; greatest breadth beyond the middle; upper portion, by a line drawn from the base through the apex, twice as

broad as the lower portion; costal marginal nerve very convex from base to apex; costal margin reflexed as far as or beyond the stigma; costal basal cell long, somewhat narrow; apex nearly at the middle of the marginal nerve; stigma very short, base and apex blackish; radius short, scarcely twice the length of the stigma, measured on the marginal nerve; apex blackish; cubitus petiole short, about one-third the length of the almost straight upper arm; upper furcation very large; upper branch convex, running almost parallel with the marginal nerve; base of the furcation joined to the radius by a very fine transverse nerve; arm of the lower furcation long, slightly curved, about twice the length of the petiole; lower furcation very small; dorsal marginal nerve convex from the middle to the apex; margin with seven sordid-yellow spots of irregular size and shape, and two nervelets, one in the upper furcation, the other in the area between it and the lower furcation. Legs pale yellow. Thighs, 2nd pair brown. Tibiæ, 3rd pair yellow, clothed with short hairs, with a short, curved, angular tooth at the base; apex dilated, margin partially serrated. Abdomen above fuscous; underneath greenish yellow; genitalia fuscous, with a somewhat pectinate row of short, shining, appressed hairs down the side at the base, and a few long, very fine, erect ones at the apex. Length, 3 lines (Paris).

Tyora, *Walk.*

Caput deest. Thorax: pronotum angustum, convexum; mesonotum convexum, apud elytrorum insertionem pronoto latius. Elytra elongata, apice acuta; furcæ superioris brachium apice nervo transverso cum radio connexum; costa etiam cum radio apud stigmatis apicem nervo transverso juncta; nervuli marginalis quaterni. Pedes: tibiæ posticæ basi denticulo armatæ; apice dilatatæ, serratæ.

Head wanting. Thorax: pronotum narrow, convex; mesonotum convex, wider across the insertion of the elytra than the pronotum. Elytra elongate, acute at the apex; apex of the arm of the upper furcation joined to the radius by a transverse nerve; costal marginal nerve at the apex of the stigma joined to the radial nerve by a transverse nerve; margin with four nervelets.

Legs: tibiæ, 3rd pair with a tooth at the base; apex dilated; margin serrated.

Tyora congrua. (Pl. XIX., figs. 5—5*c*).

Tyora congrua, Walker, Ins. Saund. Hom., p. 111.

Pallide fusco-rufa. Thorax: pronotum angustum, flavum, leviter rufo tinctum, medio antice rotundatum, utrinque emarginatum; latere prope margines (fovea nigricante intus impressos) nonnihil dilatata et rotundata; discus canalicula tenui, transversa, inter foveas ducta. Mesonotum convexum, pallide fusco-rufum; spatium centrale apud elytrorum insertionem pronoto multo latius, linea prope medium utrinque longitudinali, flava, pallida, binisque remotioribus, incurvis, circulum pæne discribentibus; latera, sicut et regio scutellaris, pallide flava. Elytra clare pellucida, elongata, lanceolata, apice acuta, latitudine sua paulo plus quam triplo longiora; nervi intaminate fusci; costa ubique convexa, basi incrassata, margine reflexo; stigma perangustatum; radius elongatus, nervo marginali paulo supra apicem terminatus, et cum eodem ad stigmatis apicem nervo transverso connexus; cubiti petiolus furcæ superioris brachio dimidio fere longitudine æqualis; furca medio emensa petiolo longior, basi cum radio nervo transverso conjuncta; brachium inferius petiolo fere æquale; distantia inter ramorum apices utrique furcæ eadem; nervuli marginales quaterni, quorum terni (sicut in *Trioza*) dorsales, quartus in area radio furcæque superioris ramo proximo interclusa; disci margo dorsalis late fusco colore, pallido, intaminato, obumbratus. Pedes flavi. Tibiæ posticæ basi denticulo crasso, triangulo, hamato, instructæ; apice dilatatæ, serratæ, nigræ. Abdomen superne fuscescens, medio plus minus rubicundum, segmentis duobus apicalibus rufis; inferne flavum, segmentis postice plus minus rufo limbatis; genitalia flava.

♂. Pale fuscous-red. Thorax: pronotum narrow; yellow, slightly tinged with red; anterior margin emarginate on each side the rounded centre; sides near the lateral margins slightly dilated and rounded; within the latter a dark fovea; disc with a fine transverse channel extending between the foveæ. Mesonotum convex, pale fuscous-red; central portion much wider across

the insertion of the elytra than the pronotum, with a pale yellow longitudinal line on each side the centre, and another curved one more remote, almost forming a circle; sides pale yellow; scutellar portion pale yellow. Elytra clear, transparent; elongate, lanceolate; apex acute; length a little more than three times the breadth; nerves clear fuscous; costal marginal nerve convex throughout its entire length, stout at the base; margin reflexed; stigma very narrow; radius long, terminating in the marginal nerve a little above the apex, joined to the marginal nerve at the apex of the stigma by a transverse nerve; cubitus petiole about half the length of the arm of the upper furcation; furcation, measured through the centre, longer than the petiole; base of the furcation joined to the radial nerve by a transverse nerve; lower arm about equal in length to the petiole; distance between the apices of the branches of the two furcations equal; margin with four nervelets; three on the dorsal margin, as in *Trioza*; 4th in the area enclosed between the radius and the adjoining branch of the upper furcation; disc along the dorsal margin with a broad, pale, clear fuscous shade. Legs yellow. Tibiæ, 3rd pair at the base with a stout, triangular, curved tooth; apex dilated; margin serrated, black. Abdomen above somewhat fuscous, more or less red down the centre; two terminal segments red; beneath yellow; posterior margin of the segments more or less red; genitalia yellow. Length (without head), 3 lines nearly (Paris).

There is a single specimen in the collection from Mysol.

Note.—Owing to the remarkable form of the genitalia of the species described in this paper, I have considered it best to give figures of the parts rather than descriptions, as they would have been very difficult to describe in a moderate space, and even then not convey the peculiarities sufficiently well to the mind of others.

Explanation of Plates.

PLATE XVIII.

No. 1.—*Psylla Duvauæ.*

1, elytron; 1*a*, head, front view; 1*b*, do., side view; 1*c*, antenna; 1*d*, genitalia (♂), as seen from the side; 1*e*, do., as seen from behind; 1*f*, leaf, showing form of galls made; 1*g*, top or cover of a gall.

No. 2.—*Neolithus fasciatus.*

2, elytron; 2*a*, head, front view; 2*b*, do., side view; 2*c*, antenna; 2*d*, genitalia (♂), as seen from the side; 2*e*, do., as seen from behind; 2*f*, twig, with gall, natural size.

No. 3.—*Thea trigutta.*

3, elytron; 3*a*, head, front view; 3*b*, do., side view; 3*c*, antenna; 3*d*, genitalia (♂), as seen from the side.

No. 4.—*Phytolyma lata.*

4, elytron and wing; 4*a*, head, front view; 4*b*, do., side view; 4*c*, antenna; 4*d*, genitalia (♂), as seen from the side; 4*e*, do., as seen from behind; 4*f*, portion of leaf showing form of gall.

No. 5.—*Phyllolyma fracticosta.*

5, elytron; 5*a*, head, front view; 5*b*, do., side view; 5*c*, antenna; 5*d*, genitalia, as seen from the side; 5*e*, do., as seen from behind.

PLATE XIX.

No. 1.—*Psylla arctica.*

1, elytron; 1*a*, head, front view; 1*b*, do., side view; 1*c*, do., side view: 1*d*, genitalia (♀), as seen from the side.

No. 2.—*Petalolyma basalis.*

2, elytron; 2*a*, head, front view; 2*b*, do., side view; 2*c*, antenna; 2*d*, one of the 3rd pair of legs; 2*e*, genitalia (♂), as seen from the side; 2*f*, do., as seen from behind.

No. 3.—*Creiis longipennis.*

3, elytron; 3*a*, head, front view: 3*b*, do., side view; 3*c*, antenna: 3*d*, genitalia of *P. livioides*, Walker, as seen from the side; 3*d'*, do., as seen from behind; 3*e*, genitalia of *Livia longipennis*, Walker, as seen from the side; 3*e'*, do., as seen from behind.

No. 4.—*Carsidara marginalis.*

4, elytron; 4*a*, head, front view; 4*b*, do., side view; 4*c*, antenna; 4*d*, one of the 3rd pair of legs; 4*e*, genitalia (♂), as seen from the side; 4*f*, do., as seen from benind.

No. 5.—*Tyora congrua.*

5, elytron and wing; 5*a*, one of the 3rd pair of legs; 5*b*, genitalia (♂), as seen from the side; 5*c*, do., as seen from behind.

XIX. *On a visit to Ceylon, and the relation of Ceylonese beetles to the vegetation there.* By George Lewis.

[Read August 2nd, 1882.]

In Ceylon the usual outlines of an island divide the country into natural areas, each one of which is distinctly different from another in soil and climate, and consequently in fauna and flora. And if we consider roughly what these features are, we shall understand something of the general characteristics of the insects and their relation to the varying physical conditions under which they live. The differences which are sufficient for this note are primarily traceable to the formation of the earth's surface, and are easily divided into three sections :—

1. The hot plains, or low lands of the coast, with rivers.
2. The intermediate altitudes, with fair-sized streams.
3. The higher altitudes, with elevated plateaux and mountain torrents and rivulets.

Ceylon from very remote times has been almost entirely, if not quite, covered with dense jungle, and as the soil is an extremely poor one, for the best elements of it are carried away by the heavy rains, the vegetation which has arisen has naturally largely derived its nutriment from the moisture in the atmosphere. This is true of the hard-wooded timber which forms the mass of the jungle, and even more dependent on the general humidity are the ferns, orchids, and other parasitic plants which grow upon and often cover the trees. If the south-east monsoon ceased to bring the abundant rain to Ceylon, the island would become a useless desert; the rain alone keeps it verdant, as we see it, and in the north about Hambantota, where the rainfall is only 34 in., there is hardly any verdure on the sandy plains. The district about Colombo, where the vegetation is rich and tropical in every sense of the word, is entirely of a sandy soil, and there is little in it to support the beautiful and strange vegetation growing there, and the secret of the luxuriance

lies in the copious rain. Except in the dry season, when both vegetable and animal life languish for showers, there is daily heavy rain. The level flat lands of the coast lying at the foot of the higher altitudes are a more recent formation than the hills, as they are formed of the accumulation of soil washed down from the mountains during long periods of rain, and it will be seen that these low lands have a fauna intermixed with species essentially distinct from those of the interior of the island. The jungle is not so continuously established on the low lands, nor even at an elevation of 2000 feet, as on the hills, the oldest formation, where the only natural roadways through the forest are the mountain torrents, which make and keep clear a passage by the sheer force of the water in the wet monsoon, and in the dry season you can walk for many miles on the granitic formation which paves these ancient channels. In the intermediate districts (2) the jungle trees attain a height of 100 to 200 feet, and gradually lessen in proportion to the elevations on which they grow. On the Nuwara Eliya plateau most of the trees are about 40 to 50 feet only, but wherever the forest is, the trees are so closely packed together that they rarely attain to any considerable circumference. And another thing is very notable about the jungle trees; they are not like our oaks and elms, of a soil-improving nature; they do not make mould like European deciduous trees; they return apparently to the soil as little as they take from it. The shed leaves are more like those of the holly and laurel, from which our gardeners would expect little assistance in manuring or improving poor soils.

Now, in a country like this the Coleoptera are in by far the greater part such as depend on plants and trees for their general welfare. We find subfamilies and genera taking a prominent place in the fauna whose allies in other countries are truly ground-beetles, but which here are herbaceous or arboreal. There are numbers of species of *Tricondyla* and *Collyris*, *Cicindelidæ* as much adapted for a foliage-life as those of our coast are for a sand existence. *Tricondyla* in Coleoptera, *Mantispa* in Neuroptera, with certain *Mantidæ* (*Pterostenes*) associate together, seeking their food on the undergrowth in the forest, and, being possessed of similar instincts, have acquired an analogous form and structure. They are all carnivorous, and roam about foliage, holding their prey with their fore legs, and

are good types of species which exhibit that most beneficent phase in the laws of Nature which causes animals of widely different orders to assimilate and adapt themselves to special modes of existence. The majority of the *Geodephaga* are of arboreal habits, and live on trees; *Colpodes*, *Demetrius*, and other genera assert themselves in many species, and are instances of those which live on the foliage; while others which replace *Pterostichus*, &c., which live under stones in Europe, are represented by *Physocrotaphus* and others, which reside in the rotten touchwood of prostrate timber. There is almost an absolute tendency in Ceylon for *Geodephaga* to become xylophilous, and with the exception of the *Harpali*, hereafter mentioned, I did not find a dozen beetles under stones, and yet I accumulated over 10,000 specimens. *Morio*, *Catascopus*, *Miscelus* again are several only of a long line of truly bark genera. Stones in situations under 6000 feet elevation in exposed places become too heated for a shelter to Coleoptera, nor are they even useful as such when under the cool shade of the jungle; for the climate does not render it necessary for insects to seek for any but the most scanty protection, which a mere scrap of moss or loosened bark can supply.

Out of six species of *Scarites*, I found only one came from beneath stones, and that occurred at an elevation of 7000 feet; the others were habitually secreted under logs or fallen timber. And in the allied genus *Clivina*, the commonest species on the coast mixes with the *Aphodii*, and clusters like them together in groups of six or eight at a time.

In all families we find the most curiously formed species (and these are many) are, with a few exceptions, dependent on leaves, plants, or trees. The paucity of what we consider ordinary forms in Europe is also remarkable, and those found are such as may occur almost anywhere in a ditch, or by a river side, and include *Bembidia*, *Dyschirii*, and the commonest forms of *Hydradephaga* and *Staphylinidæ*. The whole of these may be classed as immigrants, and are not, as I believe, even local modifications of Indian forms. There is nothing grand or striking in the fauna, as exhibited in my five months' collection, which does not live on dead timber or living vegetation.

Some of the recorded *Paussidæ* are very fine, and these prove no exception, as they are indirectly connected with

the vegetation, for the *Formicidæ* are arboreal. The nests are seen everywhere under bark, or in the trunks of trees, and some draw the foliage together some feet from the ground for an habitation. And *Paussidæ* are the associates of ants.

As some of my captures (about 1200 species) are likely in due time to be described, I give for the information of authors and others a table of the localities I visited, and the dates of my sojourn :—

	Altitude.	
Galle	On coast level	Nov. 27 to Dec. 4, 1881.
Dikoya	3800 to 4200.	Dec. 6 to Jan. 16, 1882.
Kitulgalle	1700	Jan. 17 to Jan. 20, ,,
Dikoya	3800 to 4200.	Jan. 21 to Feb. 7, ,,
Nuwara Eliya	6234 to 8000.	Feb. 8 to Feb. 11, ,,
Dikoya	3800 to 4200.	Feb. 13 to Feb. 16, ,,
Kandy	1546 to 1727.	Feb. 17 to Feb. 23, ,,
Dikoya	3800 to 4200.	Feb. 25 to Feb. 27, ,,
Bogawantalawa	4900 to 5200.	Feb. 28 to Mar. 12, ,,
Balangoda	1776	Mar. 13 to Mar. 16, ,,
Horton-Plains	6000 approx.	Mar. 18 to Mar. 20, ,,
Bogawantalawa	4900 to 5200.	Mar. 21 to Apl. 4, ,,
Kandy	1546 to 1727.	Apl. 6.
Colombo	On coast level	Apl. 7 to Apl. 27, ,,

Section I.—Galle and Colombo lie on the shore, and the neighbourhoods of both these ports are rich in species, and the majority of them can be put into three classes :—

(*a*). The arboreal and herbaceous species, of which many occur also "up-country," and others which infest the palms and vegetation peculiar to the coast.

(*b*). The ordinary forms of marsh species, which assimilate to those of more northern regions, and which also occur generally throughout Ceylon.

(*c*). Some curious sand and river species (*Selina Westermanni*, Mots., &c.), none of which could exist with their present instincts and habits in dense jungle, for they are fitted for open places of mud and sand, such as estuaries of rivers or banks by the sea. They are far removed from the *Bembidia*, *Dyschirii*, &c., classed here as immigrants, and of their origin two questions arise. Have their ancestors come from India? or are they endemic, modified from ancient forms during the forma-

tion of the alluvial soil where they reside? Nature does not at present supply us with such handy data as the latter for ascertaining the age of a species, but I am not inclined to favour the suggestion of migration. I believe they are descendants of forms which resided in primeval times in the open spaces of the mountains while the jungle was yet forming on the hills, and that they have gradually occupied the plains as they were formed by the rains. *Ophionea* and *Casnonia* I give as examples of genera abundant at Colombo, and which extend to the extreme east of equinoctial Asia, and which are, as the *Bembidia*, undoubtedly introduced by the ordinary methods of natural conveyance.

The cocoa-nut palm, which is necessarily confined to the coast, as the bulky nut requires human agencies to carry it beyond the area of littoral inundations, here nourishes a few species, notably the large *Sphenophorus*. And the Wedas, and other early races of Ceylon, have always been confined to the lowlands, and, even had they reached the higher altitudes, they would not probably have carried the palm with them, for their civilisation has hardly led them to even the most simple horticulture. The palm, therefore, has had no chance of undergoing those hardening processes which might enable it to stand the colder climate of the higher districts. *Batocera* is erroneously called the cocoa-nut beetle, but this genus feeds both here and in Japan on the half-embedded branch-like roots of the larger forest trees. Speaking of Longicornia, it may be well to note that they are rarer in the lowlands than in the higher regions of dense forests, for they are not attached to the palms which grow largely in the area of the coast-level to the exclusion of the trees suited to them. There are only a few land-leeches near Colombo, which is an immense comfort to any one wishing to roam in the jungle.

Section II.—Kandy, Balangoda, and Kitulgalle are places of an intermediate altitude, which I visited. At the first place is the botanical garden of Peradeniya, supported by our Government; it is bounded on one side by a fair-sized river, and the trees in it are isolated and well grown. In the middle of the garden stood a very large fig, eight or ten feet in diameter, which had been dead about three years, and by the kindness of the superintendent I was permitted to bark it. After the lower part had been examined, a Singhalese was sent up

into the higher branches, and large sheets of bark were thrown down on to my cloth. In four or five hours I obtained about eighty species of Coleoptera, but this was the only good tree it was my fortune to find in the intermediate or low country. On the sand-banks of the river I obtained some nice *Geodephaga*, *Selina Westermanni*, *Planetes*, and others which will probably come into new genera, and some *Staphylinidæ*, the latter mainly agreeing with the "up-country" species.

The Bombax, or cotton tree, remarkable for its straight stem and vigorous parallel branches, is a good tree when dead for bark species, and is deciduous, giving large red flowers in February before the leaves appear. It grows up to an altitude of 1500 to 2000 feet, but not higher. A large black species of *Elateridæ* is especially attached to it. The cacao tree (*Theobroma cacao*), the tender leaves of which hardly bear a breath of wind, is cultivated near Peradeniya with fair success. The low grass and herbage under the trees in the garden was not too rank to permit sweeping, and I took a great many phytophagous insects in my net.

Section III.—In the Dikoya and Bogawantalawa districts, where I spent most of my time, on the "Hadley" and "Lynford" estates respectively, most of the land has been cleared of jungle, and is now under cultivation for coffee and chinchona. Jungle-belts are left here and there as a protection in the south-west monsoon, and also on the mountain ridges to insure an abundant rainfall. When the jungle or forest is to be cleared for planting, it is cut down in October and left till February, and then burnt after the longest interval of rain. The trunks of the largest trees are not consumed by the fire, nor are their stumps uprooted; both are simply left among the coffee, and, many being of iron-wood and other hard kinds, it is likely they will remain much in the condition of to-day for the next fifty years. The time between the felling of a new clearing and the burning is the coleopterist's best chance for collecting, but even after the fire a large number of insects infest the logs where bark happens to remain, or fungi and boleti grow out from the crevices in the timber. After some years the hard clean trunks, bleached by the sun, are impervious alike to the attacks of insects and the changes of the seasons. The thermometer there generally ranges about 56° to 58° at 6 a.m., and in the afternoon rises to

78° to 82° Fah. I obtained the greater part of my collection on the edges of the jungle-belts, or where the forest remained on the ridges, for, as I have noticed before, this province has been from the earliest time simply dense jungle, and I cannot call to mind at this moment more than one species which is essentially a ground insect, living in open places. The solitary instance is a species of *Apristus*, which I took running on banks in the midday sun, when the thermometer registered 123° Fah.

I found the elephant paths, which strike straight through the jungle, led into too dense forest for insects, but when I passed into the ravines with flowing water, the only other roads, I now and then came to open spaces cleared by the falling of trees, and there insects were abundant. The districts of Dikoya and Bogawantalawa lie beneath the Nuwara Eliya and Horton Plains, the altitudes of which range from 6000 to 8000 feet. These plains exhibit one very peculiar feature; the jungle is often broken up by the "patenas," or open grass-lands, and there a few, very few, Euro-asiatic forms occur. In hunting over these plains an entomologist will, from old associations, look for *Leistus*, *Carabus*, and *Pœcilus*, for the patenas are like Wimbledon Common on a large scale, with rhododendrons dotted about instead of gorse. Broom and furze both grow freely, having been brought from England, and mullein and mint thrive by the roadside, while the streams are blocked up with imported watercress. But insect-life is scarce, and all I found fell into a few genera —*Scarites*, 1; *Anchomenus*, 2; *Harpalus*, 2; *Dromius*, 1; and some *Staphylinidæ* of European type. The temperature of the lake and tarns was too low for aquatics, and there is often indications of frost on the grass, although snow never lies there.

If *Carabi* were introduced they would assuredly thrive, but the tropical heat of the zone on the coast, which surrounds these high plateaux, is a barrier against the intrusion of northern forms less easy to surmount than an ocean belt or many degrees of arid desert. It is very curious to find even the few I have mentioned, and these may be looked upon as evidences of the great distances small flying Coleoptera are borne on the wind. In the high jungle, which here continually encroached on the patenas, the beetles are nearly identical with those of Dikoya and Bogawantalawa, but they are much less abundant.

To close with a few more general remarks. There are two seasons in Ceylon, but there is nothing which corresponds in any way to spring; there is no simultaneous or perceptible movement in either animal or vegetable life. The north-east monsoon blows from October to May, and the south-west from May to October. The first is the dry season, with rain at intervals; the second brings heavy and almost daily rain, and it is in the still evenings, or in the interval of bright sunshine of the latter period, when most Coleoptera appear. Of the wet season I saw nothing, but I had this advantage, my collection, made in the comparative dry weather, kept as clean as if made in England. There are parts of Ceylon, in the north and east coasts, which differ materially, although not essentially, to the parts I describe; there are sandy dry plains and low swampy jungle, which are rarely visited except by natives, and the difficulty of journeying thither is considerable. A bullock-cart is the best mode of transit, and a few weeks would hardly be sufficient time to obtain much insight into the fauna.

There is one very important family unrepresented in my collection, and I have not noticed any members of it amongst any other Ceylonese captures. Of the *Necrophaga* I do not possess a single species, and this may be accounted for by the presence of the multitudinous ants which are ever ready to carry away the smallest particle of organic matter, and of the numerous *Corvi*, which seize upon the larger animals. In this land of forest the *Lucanidæ* are also remarkably scarce; one *Ægus*, two *Figuli*, and the large *Odontolabis* are all I found, and examples of the last only occurred abundantly under special and almost artificial circumstances. The ebonies and hard iron-woods give out little sap, not enough to supply food for these large beetles, and they are driven to the gum exuded from the *Eucalypti* which are now planted in numbers on the estates and near bungalows. There are no stercoraceous beetles in the tracts of the elephants, and the droppings of these herbaceous animals have been analysed, and prove of little value for manure. Ceylon does not appear to be sufficiently isolated to produce many very distinct or peculiar species, and I cannot say I have come across any trace of special or endemic forms. Indigenous species are of course very numerous in such genera as *Morio*, *Catascopus*, *Colpodes*, &c., but then these are allies of others which occur in a country

even so far distant as Japan, and I can select a long series of cognate forms from both places which would agree with and run close to each other, and the resemblance between the forms in adjacent countries must be greater. Amongst the smaller Coleoptera I have obtained much of interest in species, unknown as yet in museums, but there is no reason for supposing these are purely local forms, for it must be remembered the small Coleoptera of India are quite unknown.

Entomologists will be aware that most of my remarks will apply in a great part to South India, and perhaps even in a greater degree still to some of the isles of the great Eastern Archipelago, and then more generally to all tropical and subtropical parts of the globe where copious rain covers the land with dense vegetation, and where a xylophilous fauna in Coleoptera takes the place of the geophilous. But until my collection has been carefully examined, and the species referred to their right genera, it is impossible to tabulate them with any clear arrangement which would add much to the interest of this note. Enough has been shown to stamp the Ceylonese fauna generally as one intimately associated with, and dependent on, the flora, and that both have grown up together, each gradually acquiring habits or developing instincts as the propensities of each have been enforced by the innate progression of their natures, by the changing conditions of the globe, or by their mutual necessities and advantages as present in their common relations to each other.

XX. *On certain temperature forms of Japanese Butterflies.*

By H. Pryer, C.M.Z.S., &c.

[Read August 2nd, 1882.]

In the following paper I have used the term "temperature" in preference to "seasonal," as the latter word appears to me to insufficiently indicate the changes which take place in many of the Japanese butterflies which appear more than once in the course of a year.

The changes appear to me to depend not so much on the season of the appearance of the perfect insect as on the temperature the larva has borne during its existence; frequently also an odd specimen of the spring form will put in an appearance in summer, and again the summer forms will sometimes appear late in the autumn. To illustrate this I will give an instance which came under my notice five years ago. I then visited Boshiu and Kadzusa, on the opposite side of Tokiyo Bay, the extremity of Boshiu being always markedly warmer than the neighbourhood of Yokohama. It was in the month of November, and I found there the black summer form of *Polyommatus Phlæas* in abundance, while as I worked further north up the Bay this was replaced by the brightly-coloured spring and autumn form.

Our seasons are pretty evenly divided; the latter half of December, all January, February, and the first half of March being winter; the latter part of March, all April, May, and June, spring; July, August, September, summer; October, November, and the first half of December autumn.

Yokohama is situated on a plain intersected by many cultivated valleys, the land seldom rising over 100 feet in elevation; to the north the plain extends about eighty miles to the Nikko range, the nearest mountain to Yokohama being Ohoyama, in Sagami, twenty-six miles distant west. This plain, which includes both Yokohama and Tokiyo districts, forms the province of Musashi.

Temperature.—The variations in course of the year,

at the same level, are very severe. We frequently have 10° to 12° of frost in the winter, and in summer the thermometer is frequently 88° to 90° Fah. in the shade, and the sun is then very powerful.

Papilio Xuthus and *Xuthulus*.—This insect is generally found feeding on the Karatachi (*Citrus trifoliata*), and Inusanchiyo (*Xanthoxylon schinnefolium*); it is very abundant, and a succession of broods appear during the year; the insect first appears as an imago in March (the larva having fed up in the colder period of the autumn); it is then the form known as *Xuthulus*: another brood begins to appear in June, and is intermediate in size and coloration between *Xuthulus* and *Xuthus*. This form has a dimorphic female, which is sometimes yellow and sometimes pale-coloured. The early *Xuthulus* form has a red spot at the anal angle of the hind wing which is quite lost in the summer broods, which are much larger and darker. I have specimens of the small temperature form *Xuthulus* under three inches in expanse, and of the large *Xuthus* over five inches. I took the *Xuthulus* form on the Ogasawara Islands (Bonins), 500 miles due south of Yokohama, in March, although the temperature there then was as warm as in June at Yokohama, proving that the cold during the time the insect had been in the larval stage had been sufficient to produce this form instead of the large dark *Xuthus* form. This species is abundant everywhere.

Papilio Machaon.—This insect feeds on the cultivated carrot, fennel, and other plants. The difference between the temperature forms is very striking; March specimens are about $2\frac{1}{2}$ to $2\frac{3}{4}$ in. in expanse and very pale-coloured, the summer forms expanding over five inches, and are very dark handsome insects. No alteration takes place in the markings, the colours being intensified only. It is very abundant everywhere.

Papilio Alcinous.—Feeds on a climbing-plant, I think a species of *Asclepiadeæ*. The larva and pupa are very extraordinary; the first, when full-fed, has the appearance of a large mulberry, and the pupa looks more like a mollusc than the pupa of a lepidopterous insect. The imago first appears in April, and is generally then smaller than those appearing later on. This insect being almost unicolorous, cannot otherwise alter, except in size. I have noticed that the early spring male has rather an unpleasant sour smell, whereas the summer specimens

have a faint but very pleasant odour when alive. It is very abundant, and I have seen hundreds at a time on the wing, flying over the blossoming rape-fields, when the intense black of the male is very conspicuous over the bright yellow flowers.

Papilio macilentus.—First brood appears early in May; it is then very much smaller than those appearing in the summer months, but, being unicolorous, does not exhibit any alteration. I have taken it in May less than half the size of the summer broods. I have not yet detected the larva. Rare about Yokohama, but common in all the mountains.

Papilio Maacki.—Feeds upon the Karatachi (*Citrus trifoliata*), skimmea, and other trees; it is a very variable insect, and has the usual temperature forms, *Dehaani*, *Bianor*, and *tutanus* being some of the names it has received; they are all undoubtedly referable to one species. The cold temperature form is generally small and brightly coloured, the summer ones being larger and darker. Last year, in June, I took both the extreme forms on the same day. At Nikko, elevation about 2000 feet, the large summer form was abundant, but on ascending about 1500 feet more to Chiuzenji I found the smaller brightly-coloured form equally common.

Papilio Demetrius.—Feeds on the Karatachi (*Citrus trifoliata*) and other trees. The larvæ of *Xuthus*, *Demetrius*, and *Maacki* resemble each other very closely; the pupæ, however, can be readily distinguished; the food plants are also generally the same. The temperature forms of *Demetrius* vary as to size, but, being almost unicolorous, show no other differences. Abundant everywhere.

Gonepteryx rhamni.—There are two forms, the large one being found about Yokohama, and low down on Ohoyama; the smaller, sharply-pointed winged, form is found about Nikko, and generally high up in the mountains. Both forms hybernate.

Colias Hyale.—This has a very striking temperature form; it is very small, about $1\frac{3}{4}$ in. in expanse, and lightly coloured, whereas a large summer specimen will measure as much as $2\frac{1}{2}$ in. It is a very hardy insect, and first appears in February, in which month I have often captured newly-emerged specimens flying along a bank warmed by the sun, at the foot in the shade ice an inch thick being present, with patches of snow lying in all shady places. It is very abundant, and can be taken

nearly every month in the year, and is common in the mountains and on the plains. The female here, as in other species of *Colias*, is dimorphic, the white and a yellow form being equally abundant.

Pieris napi and *Melete*.—I think the latter will prove to be a temperature form of the first-named species, which only appears in March and April. *Melete* begins to put in an appearance in the latter part of May; subsequent broods increase in size and depth of coloration. I have round-winged May specimens $1\frac{7}{8}$ in. against $2\frac{7}{8}$ in. long-winged August specimens. There is as great a difference between May and August specimens of *Melete* as there exists between *Melete* and *napi*.

Pieris rapæ.—Appears first in March small and light-coloured; subsequent broods are larger, and in the female very darkly clouded at the base of the wing. I have, however, taken in July, about 3000 feet up Fujisan, smaller specimens than those obtained about Yokohama in March. Mr. Elwes in his list (Proc. Zool. Soc., 15th Nov., 1881) gives *Pieris brassicæ* as being found in Japan, but I have never seen either the imago, larva, or pupa of this insect here, His remarks refer to *rapæ*, which is very abundant. The food-plant, larva, and pupa do not differ from the home species.

Terias Hecabe, &c.—Six years ago, in March, I observed a hybernated specimen of *Terias Mandarina* depositing its eggs on *Lespedeza junca*; I took these, and was much surprised by breeding from these eggs the black-bordered *Hecabe* form. At the time I thought some larvæ of *Hecabe* must have been accidentally introduced into the breeding-cages, and hesitated publishing the fact until I had verified it. This year I have repeated the experiment fully, and I am now in the position to assert positively that *Hecabe* and *Mandarina* are one species. I obtained a number of the plants and potted them, after carefully examining every leaf for eggs or larvæ. I then caught a number of female *Mandarina*, and enclosed them in a gauze house with the plants, and soon obtained a good supply of eggs. The perfect insects are now emerging, 1st to 20th June; no two specimens are exactly alike, and they comprise all the forms from Nos. 1 to 11 of Plate vi., Trans. Ent. Soc. Lond., 1880. Nos. 12 to 17 are the autumn forms, which hybernate. Sixteen specimens in all have emerged, eight females and eight males. It is a very remarkable fact that four of the specimens,

three females and one male, are the *Mandarina* form. I have never captured this form at this season of the year, or even seen anything approaching it, although twenty or thirty of the other forms are now brought in daily by my collector, to whom I have given special instructions to capture as many *Terias* as possible. Six specimens, five males and one female, are the *Hecabe* form as figured in the plate, Nos. 1 to 6; two specimens, both males, represent figures 7 to 11; and one female can also be placed in the same rank. One female would do for either forms, Nos. 1 to 6 or 7 to 11, as it unites both in having a more distinctly marked black edge on the right wing than on the left wing; the remaining specimen, a female, is quite a new form intermediate between Nos. 7 to 11 and 12 to 17. This insect is, therefore, very sensitive to temperature influences, and I believe it is owing to my having reared these specimens in a cold room, without much direct sunlight, that I have been so successful in procuring all these forms from a single lot of eggs. Although I am perfectly aware that I shall be charged with perpetrating a serious scientific solecism, still, taking into consideration the exceptionally large numbers of forms of this insect which have been described as distinct species, I venture on proposing yet another name, and uniting all those hitherto described under the name of *Terias multiformis*.

Terias multiformis, viz. :—

Terias	*Hecabe*	
	Mandarina	See Mr. Elwes' Catalogue, Proc. Zool. Soc., Nov. 15th, 1881.
	Hecabeoides	
	sinensis	
Japan . . .	*Mariesii*	Mr. A. G. Butler, Trans. Ent. Soc. Lond. 1880, p. 197.
	Anemone	
	connexiva	
	hybrida	
Australia . .	*Æsiope*	Rev. R. P. Murray, Trans. Ent. Soc. Lond. 1875, p. vii.
West Africa .	*Brenda*	
Malacca . .	*Sari*	

Terias senegalensis is given in the Catalogue of the Hewitson Collection, one specimen from Japan. I should like to know whether it can be referable to *Terias multiformis*. I have two specimens of a *Terias* from Singapore marked like the *Hecabe* form, but with fore wings more rounded than the usual Japanese specimens.

I have, however, two Japanese specimens which differ from each other in markings, but which are nearly as round-winged as those from Singapore. I shall be greatly obliged for notes on the genus *Terias*, and specimens from any part of the world, for which I shall be glad to send Japanese insects. The remaining species of Japanese *Terias* are *Terias Bethesba*, which appears only in summer, and *Terias Læta*, which is out all the year round, hybernating in the winter. I have a specimen, and Mr. Ota has another, without the black marking on the tip of the wing.

Leucophasia vibilia I obtained, in considerable quantities, from Nambu, in the north of the main island; it may be a temperature form of *sinapis*, as Mr. Elwes suggests, but I cannot say for certain.

Lethe Sicelis and *Diana*.—The latter is, I think, a temperature form of *Sicelis*; *Diana* is only found in the mountains, *Sicelis* on the plains. The difference between the two forms is in colour and size only; the markings are identical; both are very abundant in their respective localities.

Neope Goschkevitschii.—This also has a dark temperature form found in the mountains. I have taken it high up on Ohoyama, when the paler plain form at the foot of the mountain was very much worn. It is a very abundant insect.

Ypthima Baldus.—I have two forms, both taken about Yokohama; one is light on the under side, and is very abundant; the other is as dark on the under side as it is above.

Limenitis Sibylla.—I have specimens from Fujisan with a large distinct white stigma. Yokohama specimens sometimes exhibit a trace of this stigma.

Vanessa C-aureum and *Pryeri* are undoubtedly identical. *Pryeri* is a temperature form which appears in the autumn, and hybernates; it feeds on the cultivated hemp. Difference in the shape of the wings of the two forms is very noticeable. It is a very abundant insect on the plains.

Vanessa C-album, *Fentoni*, and *hamigera*.—I quite agree with Mr. Elwes in thinking that these are all forms of one species. The difference between *Fentoni* and *hamigera* is exactly the same as between *C-aureum* and *Pryeri*. I have not taken either *Fentoni* or *hamigera*, but I believe Mr. Fenton informed me that *Fentoni* was found

high up in the Asamayama district, *hamigera* being confined to the foot of the range.

Polyommatus Phlæas. — This insect is very strongly affected by temperature; the first brood, which appears in March, is very brightly coloured; the latter summer broods, in the male, are almost black.

Lycæna Argiolus.—The late broods are generally larger than the first, which appears very early in the year. The females are in summer especially large and dark; two forms, however, then appear, one dark, and a much brighter form.

Lycæna Argia and *Japonica* are, I believe, identical. *Japonica* appears late in the autumn, and again in the spring; it is then replaced by *Argia* in summer.

In conclusion I would remark that neither size, shape, nor colour can be relied upon as sufficient guides for specific distinction, and that temperature has a great evolutionary effect in the character of insects, but this has hitherto been greatly obscured owing to the misdirected zeal of various entomologists who have hastened to describe insects as new species without sufficient investigation.

XXI. *Descriptions of new* Coleoptera *from Madagascar belonging to the* Melolonthidæ. By Charles O. Waterhouse.

[Read August 2nd, 1882.]

The species described in this paper are mostly from various collections recently received at the British Museum from Madagascar. The genera of *Melolonthidæ* are somewhat unsatisfactory, and I have therefore refrained from proposing new genera, except in one case. The species which I have described as *Encya variegata* and *E. cribrata* are allied to *Encya ornatipennis*, Blanchard, and all these species depart from the definition of the genus in having more than four lamellæ to the club of the antennæ. *E. ornatipennis*, male, has the club composed of five lamellæ; *E. cribrata*, male, six lamellæ; and *E. variegata*, male, seven lamellæ. The species which I have described as *Lepidiota pygidialis* differs from all the species of the genus in the acute prolongation of the apex of the pygidium; but, having regard to the mixed group of species now included in the genus *Lepidiota*, I have not deemed it advisable to separate this species generically, as that would be better done by any one monographing the family.

MELOLONTHIDÆ.

RHIZOTROGINÆ.

Enaria, *Er.*

In Lacordaire's 'Genera des Coléoptères' the club of the antennæ is said to be three-jointed, but a note is added to the effect that all the specimens examined were females. The specimen described below as *E. marginata* is a male, and of *E. depressiuscula* there are both sexes. The males differ from the females in having the club of the antennæ composed of four leaflets, which are very distinctly longer than those of the female; the 7th joint,

however, is not so much produced as the 8th, 9th, and 10th. The fringe of spines at the apex of the posterior tibiæ is more developed in the female than in the male.*

Enaria latifrons, n. s.

Oblongo-ovata, convexa, flavo-testacea, nitida; capite grosse punctato, thorace longitudine duplo latiori antice paulo angustiori, lateribus leviter arcuatis crenulatis, margine antico leviter bisinuato, dorso sat crebre grosse punctato, scutello evidenter punctato, elytris grosse crebre punctatis, pygidio confertim grosse punctato, abdomine sat crebre grosse punctato. ♀. Long. 7 lin.

Hab. Madagascar.

Enaria marginata, n. s.

Elongato-ovata, flavo-testacea, nitida; capite piceo grosse punctato, thorace piceo, lateribus flavescentibus, scutello lævi, piceo, elytris marginibus calloque humerali piceis, pygidio crebre grosse punctato, abdomine medio hic et illic puncto impresso, latera versus crebre fortiter punctato, tibiarum apicibus tarsisque piceis. ♂. Long. 8 lin.

Hab. Fianarantsoa (*Shaw*).

In the British Museum there are two species of *Enaria*, which I have briefly described above, evidently closely allied to *E. rufofulva*, Fairmaire (Ann. Fr., 1880, p. 327), but I cannot reconcile either of them with it.

E. latifrons is nearly uniform in colour, but the head is a little darker yellow. The front margin of the thorax is slightly sinuate on each side of the middle; in which it differs from *E. marginata*, which has it straight. The punctures are rather large and deep, and not very close together. *E. latifrons* has the posterior angles completely rounded off; in *E. marginata* there is a slight

* The important difference in the development of the apex of the posterior tibiæ in the *Melolonthidæ* appears almost to be overlooked by Lacordaire. The females have the apex more enlarged than in the males, accompanied by a greater development of the spines and spurs. This is very observable in the common *Melolontha vulgaris*, but in some of the larger *Lepidiota* the difference is very great. Under *Ancylonycha* Lacordaire says, "Jambes postérieures évasées au bout surtout chez les femelles," the only mention of this character which has come under my notice.

angulation. The elytra in *E. marginata* are a little longer than in *E. latifrons*, but the punctuation is similar. The pygidium in both species is very strongly punctured; in *E. latifrons* the punctures are crowded together, whilst in *E. marginata* the punctures are distinctly separated, and in places there is room for punctures of the same size in the intervals. *E. marginata* has the abdomen with a very few punctures in the middle; in *E. latifrons* the punctuation is nearly equally strong and close throughout.

Enaria depressiuscula, n. s.

Elongato-oblonga, subparallela, sat convexa, nitida, flava; capite thoraceque rufo-flavis discrete punctatis, elytris dorsim depressiusculis, evidenter crebrius punctatis. Long. 8½ lin.

This species is relatively longer than any of the others, more parallel, and has the elytra flattened above; the suture is, however, raised, as is usual in the genus. The head and clypeus are strongly, but not very closely, punctured. The thorax is gradually, but not very, much narrowed from the base to the front angles, gently arcuate at the sides; the punctures are strong and rather distant from each other. The scutellum is distinctly and not very thickly punctured. The elytra are very little enlarged posteriorly, subparallel, the punctuation is strong, and a little closer than on the thorax; the suture posteriorly and the margins are most narrowly tinted with dark brown.

Hab. Antananarivo (*Kingdon*); Fianarantsoa (*Cowan*).

Encya calva, n. s

Oblonga, flavo-testacea, calva, nitida; capite thoraceque (lateribus exceptis) piceis, crebre punctatis, scutello piceo, lævi, elytris minus nitidis crebre punctatis, macula ante apicem piceo nitido. Long. 7 lin., lat. 4½ lin.

Head thickly and moderately strongly punctured, the punctures clearly separated from each other; the clypeus scarcely emarginate. Thorax evenly convex, pitchy, with the sides yellowish, thickly and very distinctly punctured, the punctures clearly separated from each other; broadest close to the base, narrowed anteriorly from about the middle, the margins not crenulate; the

base oblique on each side, but very slightly lobed in the middle. The elytra are not very convex, very little enlarged posteriorly. The surface is rather uneven, closely but irregularly punctured, slightly rugulose in parts, with more or less numerous small, irregular, shining, brown marks; below the subapical callosity is a rather large, brown, transverse spot. Pygidium very thickly and strongly punctured. The sternum is clothed with long yellow pubescence. The abdomen is nearly smooth in the middle, but is rather thickly punctured at the sides; with very sparse and extremely fine pubescence.

Hab. Fianarantsoa (*Cowan*).

Encya pyriformis, n. s.

Pyriformis, sat convexa, brunnea, parum nitida, dense rugoso-punctata, squamis setiformibus flavo-griseis vestita, squamisque majoribus hic et illic albidis; corpore subtus dense griseo-albo pubescenti. ♀. Long. 12½ lin., lat. (postice), 7½ lin.

Clypeus very short, but not quite so short as in the foregoing species, the emargination occupying about one-third the length. Thorax very broad behind, very obliquely narrowed in front, not very convex, closely and coarsely punctured, but the punctures are not so crowded as in *E. gutticollis*. Elytra at the base the same width as the base of the thorax, gradually becoming broader for two-thirds the length, and then obtusely rounded off; the greatest width is to the width of the base as 3 to 2; the shoulders and the subapical callosities are scarcely prominent, the latter marked by a small smooth spot below; the punctuation is very close and strong, and the narrow elevated shining intervals are confluent transversely. The setiform scales are very acute, evenly distributed over the surface, and not so dense as in the foregoing species. The sternum is clothed with moderately long soft pubescence; the abdomen with setiform scales, which are a trifle shorter and less narrow than those on the elytra.

Encya gutticollis, n. s.

Elongato-oblonga, subparallela, convexa, fusca, dense rugulosa, brevissime griseo-pilosa, subopaca; thorace guttis duabus albidis ornato, elytris postice parum lati-

oribus, brunneis, guttis parvis numerosis elevatis piceis nitidis, et squamis setiformibus albidis. Long. $10\frac{1}{2}$ lin., lat. $5\frac{1}{2}$ lin.

This species is closely allied to the preceding, but it is more parallel in form, more coarsely rugulose throughout, except on the head, where the rugulose sculpture is replaced by close, strong punctuation. The clypeus is extremely short, so that the anterior emargination reaches half-way to the posterior carina. The thorax is very densely rugose-punctate, all the raised intervals shining; on the disk, a little in front of the middle, are two white spots composed of scale-like hairs; and here and there are simple, very narrow, acuminate scales. The scutellum is densely punctured, distinctly smaller than in the foregoing species, and more equilateral. The elytra are brown, with numerous small, irregular raised, smooth, pitchy spots. Besides the fine yellowish grey hairs, with which the surface is not very densely clothed, there are narrow whitish scales, which appear to range themselves in three or four lines. The subapical callosity is scarcely prominent (but is marked by one of the small smooth spots); it is not more than one line distant from the apex, *i. e.*, much closer to the margin than in *E. invulnerata*. The abdomen is clothed with greyish pubescence.

Encya invulnerata, n. s.

Oblongo-ovata, antice paulo angustata, brunnea, dense rugulosa, brevissime flavo-pilosa, opaca; thorace guttis duabus parvis flavis ornato, elytris guttis nonnullis piceis nitidis notatis. Long. 12 lin., lat. 7 lin.

The head is densely and moderately finely rugulose; the front margin of the clypeus is triangularly emarginate. The thorax is very convex, densely rugulose (perhaps a little more finely so than the head), obliquely narrowed anteriorly from rather behind the middle; the anterior angles scarcely prominent; the sides crenulate, slightly angular a little way from the base; the base with a medial lobe. On the disk, near the front margin, are two small spots formed of whitish scales. Scutellum densely rugulose. Elytra at the base scarcely wider than the thorax, considerably wider posteriorly, deflexed at the apex; densely rugulose, the suture slightly raised

and shining (but rugose) to near the subapical callosity; here and there are small, irregular raised, shining spots.

Hab. Antananarivo (*Shaw*).

Encya variegata, n. s.

Elongato-ovata, convexa, nitida, picea, subtus testacea; thorace minus crebre punctato, lateribus testaceis, elytris flavo-testaceis crebre sat fortiter punctatis, guttis numerosis irregularibus parum elevatis piceis. ♂, ♀. Long. $7\frac{1}{2}$ lin., lat. $3\frac{3}{4}$ lin.

This species much resembles *E. ornatipennis*, Bl., but differs from the specimens so named in having the thorax more rounded at the sides posteriorly, so that the posterior angles are much more obtuse, in fact almost rounded off; the punctuation is much less close, and the sides are margined with pale yellow. The scutellum is smooth in the male example, but has a very few punctures in the female. The elytra are pale yellow, strongly and closely punctured, but not so rugose as in *E. ornatipennis*; the smooth brown markings have a tendency to unite tranversely, but in places seem to indicate longitudinal, interrupted costæ. The two teeth on the anterior tibiæ are small as compared with *E. ornatipennis*. The abdomen has no scales, but has some short, very fine, pubescence; the punctures are rather strong, and not close together.

The male has the first joint of the antennæ moderately elongate; the second is short; the third has its inner apical angle produced into a process which is as long as the length of the joint; the six* apical joints form a rather long, scarcely curved, club.

The female has the third joint long and slender; the fourth joint is almost half the length of the third; the fifth is strongly transverse and wider; the sixth is still wider and very transverse; the *four* apical joints forming an ovate club.

Hab. Antananarivo (*Shaw*).

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* The apical joint is divided at its apex, showing that it is a malformation, the ninth and tenth joints having grown together. The specimen unfortunately has lost the other antenna. The club would, doubtless, consist of seven joints.

Encya cribrata, n. s.

Præcedenti affinis, sed paulo latior, picea, confertim ruguloso-punctata; abdomine creberrime punctato, squamulis angustissimis pallidis tecto. ♂. Long. 9 lin., late $4\frac{3}{4}$ lin.

Uniform dark brown. Head and clypeus very strongly and very closely punctured. Thorax much narrowed in front, not much narrowed at the base, the sides rounded behind the middle; punctuation strong and very much crowded. Scutellum very thickly punctured. Elytra densely punctured, but the punctures are of unequal size; here and there are small, irregular, smooth intervals. Abdomen rather thickly and moderately strongly punctured; clothed with pale short setæ, or extremely narrow scales. Basal joint of the antennæ long; the second very short; the third distinctly longer than the second; the fourth about as broad at the apex as long, with a slight angular projection on the inner side; the *six* apical joints forming a rather long straight club.

Eutrichesis, n. g.

Clypeus very transverse, separated from the forehead by a well-marked carina. Third and fourth joints of the antennæ subequal; the club small, ovate, composed of three lamellæ. Mesosternum without intercoxal process. Anterior tibiæ with two strong teeth. Metathoracic parapleuræ long and narrow. Claws furnished beneath in the middle with a strong tooth.

I propose this genus for some species of large size, with the body clothed with a mixture of shorter and very long hair. Although the large size of the species would lead one to look for these insects among true *Melolonthidæ*, they should certainly, on account of the narrow parapleura, be placed with the *Rhizotroginæ*, near *Schizonycha*.

It appears to me that *Tricholepis*, Blanch., which Lacordaire "has no hesitation in uniting with" *Lepidiota*, would be better transferred to the *Rhizotroginæ*, on account of the narrow metathoracic parapleuræ. *Melolontha lactea*, Gory, *Leucopholis lepidota*, Klug, *Melolontha grandis*, Cast., and *Lepidiota Savagei*, Hope, are *Melolonthidæ*, and must for the present be put in the magazine genus *Lepidiota*, and not under *Tricholepis*, as in Gemminger and v. Harold's Catalogue. *Enthora* has narrow

metathoracic parapleuræ, and should be placed with *Encya*, among the *Rhizotroginæ*.

Eutrichesis punctatus, n. s.

Elongatus, subparallelus, convexus, crassus, castaneus, pallide-pilosus et longe fulvo-hirtus ; capite thoraceque fuscis, opacis, rugosis, elytris nitidis crebre fortiter punctatis, corpore subtus majis testaceo fulvo-piloso, abdomine medio calvo. Long. 20 lin., lat. $10\frac{1}{2}$ lin.

Head and clypeus closely and very coarsely punctured ; the clypeus very short, the triangular emargination of the front margin reaching half-way to the posterior carina. Thorax broad, twice as broad as long, closely and very coarsely punctured, with an irregular smooth median line ; the greatest width is a little before the base, but it is only very slightly narrower at the base ; the sides are crenulate ; the base is broadly but not much lobed in the middle. The scutellum is fuscous, transverse, and triangular, very coarsely punctured. Elytra at the base as wide as the thorax, a little narrowed below the shoulders, and then slightly enlarged posteriorly, obtusely rounded at the apex, somewhat flattened on the back, but with the suture raised for a little more than two-thirds the length ; rather closely punctured with irregular-shaped strong punctures ; each puncture bearing a stiff yellowish-white decumbent hair or seta. On each side of the suture the sculpture is finer and more confused. The humeral callosity is smooth ; there is no subapical callosity. The pygidium is semicircular, gently convex ; very densely and finely rugosely punctured, opaque, except the margin, where the sculpture is coarser and the surface more shining. The two strong external teeth on the anterior tibiæ are blackish. The abdomen is shining, with rather large distant punctures ; the apex and margins closely punctured. The shorter pubescence which clothes the upper surface of the insect is fine on the thorax, and becomes coarser as it approaches the apex of the elytra. The long, erect, fulvous hair is especially observable on the sides and tibiæ.

Hab. Fianarantsoa (*Cowan*).

Eutrichesis pilosicollis, n. s.

Elongatus, parallelus, castaneus, subtus testaceus; capite fusco, confertim fortiter punctato, thorace convexo, fusco-castaneo, confertim ruguloso-punctato et subtiliter flavo-piloso pilis longis intermixtis, antice perparum angustato, lateribus arcuatis crenulatis, elytris parallelis crebre fortiter punctatis, pallide pilosis. Long. 14 lin., lat. 7 lin.

This species is close to the preceding, but differs in having the thorax relatively a little broader, and unusually little narrowed anteriorly. The clypeus is less emarginate. The punctuation of the thorax is finer and more even, and there is no smooth median line; the pubescence is finer and closer. The pygidium is more triangular in outline and less rugosely punctured. The punctures on the middle portion of the abdomen are finer, and the basal segment is finely and rather thickly punctured all over.

Hab. Antananarivo (Toy).

Eutrichesis placidus, n. s.

Brunneus, subtus testaceus, crebre punctatus, pallide pilosus; capite infuscato, thorace crebre fortiter punctato, elytris postice paulo amplioribus, abdomine crebre punctato. Long. 14½ lin., lat. 7½ lin.

This species differs from the foregoing in being less parallel in form, the thorax being more narrowed in front, and the elytra more enlarged posteriorly. The clypeus is formed as in *E. pilosicollis*, but the head is rather more confusedly punctured. The punctuation of the thorax is rather strong, but, although the punctures are very close together, they are distinct from each other, and not confused as they are in both the preceding species. The scutellum is more finely and more sparingly punctured. The elytra are relatively shorter; the sculpture is very similar. The pygidium is rather more semicircular in outline than in *E. pilosicollis*. The abdomen is rather thickly and comparatively finely punctured, very closely so at the sides; the middle of the second segment and middle of the third segment (the margin excepted) sparingly punctured; the pubescence very fine.

Hab. Antananarivo (*Kingdon*).

MELOLONTHINÆ.

Lepidiota pygidialis, n. s.

Ovalis, sat convexa, nitida, fusca ; capite thoraceque fortiter punctatis, punctis squamuliferis, elytris testaceis sat fortiter punctatis, calvis, pygidio planato, creberrime punctato, apice longe acuminato paulo reflexo fere lævi, abdomine piceo crebre punctulato, breviter pallide piloso. Long. 12 lin.

Elongate-ovate, moderately convex, the elytra without costæ. The head and thorax are strongly punctured; the punctures are clearly defined, close together on the front of the head and sides of the thorax, well separated on the disk of the thorax ; each bearing a small round whitish scale. The thorax obliquely narrowed in front from considerably in front of the middle ; the sides posteriorly very gently sinuous. Scutellum a curvilinear, equilateral triangle, with a few strong punctures. The elytra are yellowish testaceous, with the margins below the shoulders brown ; the punctuation is moderately strong, not very close. The form of the pygidium is remarkable. It is rather flat, thickly punctured (the punctures having a tendency to unite longitudinally), finely margined ; the apex is prolonged into an acute process, which makes a very obtuse angle with the body of the pygidium ; the process is smooth, except some punctures along its margins. The anterior tibiæ have two short teeth. The third joint of the antennæ is scarcely longer than the fourth.

Hab. Antananarivo (*Shaw*) ; Fianarantsoa (*Cowan*).

XXII. *A supplementary note on the specific modifications of Japan* Carabi, *and some observations on the mechanical action of solar rays in relation to colour during the evolution of species.* By George Lewis.

[Read October 4th, 1882.]

The paper I now offer to the Society was commenced in August to illustrate the climatical variations to which *Carabi* in Japan are subject, but the consideration of the relations of light to colour has crept into the article, and I have thought it well to leave the two subjects together, as they are closely connected, rather than separate them now. The paper is not scientific in any higher sense of the term than that attained by common observation; but perhaps later on I can refer to the subject of colour more fully. I hope there is something in the notes sufficiently tangible to incite discussion, if nothing more.

In the December number of the 'Entomological Monthly Magazine,' 1880, I described the peculiar geographical position of the Japanese islands, and gave some account of the climates of those regions in which the different species of *Damaster* originate, and I endeavoured succinctly to show that "in tracing *Damaster* from the south to the north, species became smaller, and step by step modified in form, with colour appearing the higher they go either in altitude or latitude." And I also pointed out that *Damaster* became diurnal in the north, where the warmth of sunshine was essential to it, and that with diurnal habits bright colours followed, according to the usually acknowledged laws of evolution. For as we ourselves fail to discern the fading colours of a landscape as night sets in, so Nature fails to perpetuate colour in nocturnal insects, colour itself being dependent on light-rays.

The colours of insects are often set down rather indefinitely to natural selection, in which sexual preference for beauty is supposed to be a considerable element; for

it has been said, that after colour has appeared in a species, by some cause not explained, sexual selection can continue to improve it. But a truer explanation of insect-colour, to my mind, would be, if it could be shown that by little and little, in minute gradations, through long periods, sun-rays are the cause of it. And this, I think, is the origin of it, through what may be termed Photoplasticity, a photoplastic process by which the various rays or wave-movements from the sun impress living organisms with the structure necessary for colour. What we call bright colour does not exist in obscurity; light is necessary to appreciate it, and is, I think, the factor which produces it, and that nocturnal insects are black because they are not affected by the *direct* rays from the sun.

Professor Tyndall, in 'Forms of Water,' 1878, says of the wave theory of light, "It is because of its competence to explain all the phenomena of light that the wave theory now receives universal acceptance on the part of scientific men." So the theory of the mechanical action of light may be accepted as the cause of colour, if it is sufficient to explain the phenomena of colour; and it is the object of a portion of this short note to bring forward a few facts tending, as I think, to prove it.

Damaster blaptoides is a nocturnal insect; it is a night-rover, and during the day secretes itself in the rotten touchwood of old trees, remaining always well out of the light. *Noctuæ* are not nocturnal in this sense, as they are exposed to certain rays of light during the day. Some, e. g. *Aplecta tincta* and others, possess a colour called a protective colour, and rest on mottled moss-grown bark in the daytime, and it is then their colours are originated, not during flight, for their tints are not then visible, and it is on the upper wings alone that maculation appears. If we believe that there has been, and still is, a continuous modification of species throughout Nature, we must consider that the *Noctuæ* and the lichens have grown together, each out of some older form, sufficiently long to have been more or less modified side by side, as the contingencies of their existence dictated change; and, as their colours assimilate, we must, I think acknowledge, that they have acquired them by the same natural processes; say, for instance, in the subdued light-rays of an umbrageous

forest. Let another instance be cited. Everywhere on the soil in summer time we see innumerable *Formicidæ*, active and bustling, running here and there in the sunniest places; some are fuscous, others reddish, but with them we do not see the flavous species. To find *Lasius flavus* we turn over stones, and then see the yellow worker, which burrows and remains in the nest under them; while the male and female more frequently leave the nests, and are less flavous. I have seen numbers of exotic *Formicidæ* of the same colour and habit, for, as it is under the shelter of the forest with the lichens and *Noctuæ*, so under the stones, there seems something in the nature of the shelter, to cause a peculiar colour, this time yellow. And, as a further indication of the same kind, we find a rufo-testaceous tint in *Claviger*, *Hetærius*, *Corythoderus*, *Paussus*, which reside in situations similar to those of the worker in *Lasius*. I have *Articeros* from the nests of a fuscous ant with nests under stones, but the instincts and habits of the *Formica* lead it abroad, and during daylight it continually sallies out and runs over the earth, returning to the nest only at intervals; while *Articeros* remains at home under stones, and, so hidden, retains its generic colour. With *Formica rufa* there are different coloured beetles, *Dendrophilus*, *Myrmetes*, &c., for neither the beetles nor the ants are subterraneous. In Japan there is a little gregarious beetle which consorts in societies under embedded stones, not in the open, but under large trees; it is one of the *Ozænidæ*, and has precisely the colour of the neuter of *Lasius flavus*. When colorous uniformity occurs in animals of widely different descent, yet living under the same conditions, the colours are probably of the same origin, for natural selection could not in any phase do more than continue or render persistent that which has been created by other means. Certain species of *Lampyridæ* are flavous, and in this colour are of world-wide distribution, but their habits are the same in all countries and under all climates, and we must not hastily say the colour is that of the group or family, or that it is hereditary, because, as I have said in regard to the yellow *Lasius*, the parents are *fuscous*, and it looks to me as though the conditions of life have more influence on colour than even parentage. And if the general principle of this is admitted, can the protective colour theory be allowed to occupy the position in our thoughts it has obtained during the past twenty years?

A few months ago I was observing daily *Phyllium Anthanysus*, which in Ceylon feeds on the leaf of the guava. Every nerve in the body of the larva of this insect corresponds to a vein in the leaf of its food-plant, and any one who is familiar only with the hard permanent forms in the fauna of Europe can hardly realise the degree of wonderment felt on seeing the insect alive for the first time. In life it has the beautiful greenness of the fresh guava leaf, and in death its tints fade gradually until it simulates in colour a dry specimen in the herbarium. Yet here I can only see peculiar form, for I believe the colour is of the same origin as in the leaf. No one can doubt the two things are connected, and have developed side by side, and I believe that the material substance of both is such that they absorb and reflect to us the same rays. In Ceylon, again, the larvæ of the *Daphnis nerii* feed on the recently-imported chinchona, and last January, in the early morning, I saw tomtits going the round of the plantations and feeding on the small caterpillars, which then measured about nine lines in length; the birds picked them off with the quick movements of their species, and without the least hesitation, evidently seeing the specimens clearly and at once. These larvæ were not protected by their colour, nor yet by their resting, after the manner of *Sphingidæ*, on the under side of the leaves, for I spent some time in searching in vain for overlooked larvæ after the birds had passed. In the young larvæ the side stripes and blue ocelli are scarcely visible; these beautiful and attractive markings do not develop conspicuously until the grubs are too large for the tomtits, so there is nothing in the stripes or eyes to disquiet the birds. Again, can we see protective colours in large *Carabi?* A fine *Carabus*, such as *rutilans* and *Hispanus*, can hold its own on a Spanish mountain slope against such enemies as it is now likely to encounter, and why at any antecedent stage of its earlier struggles shall we credit it with having more formidable opponents? If the conditions of its life were much altered, if the slopes were covered with dense forest, for instance, the creature itself would not be that of the present type. In the larval state, no doubt its numbers are greatly checked, being, perhaps, even decimated, by its own imagos, but I cannot see protective colouring in their beautiful metallic brightness; I think their colours have originated through

the action of sun-rays during diurnal exposure. As a phase of natural selection, I could perhaps conceive an offspring of resplendent lustre, as the result in time, of the male preferring a bright female, if natural selection could in that way originate it. But unless colour is caused by sun-rays, or originates under its action, how do the first tints appear?

In connection with the subject of sexual selection, I will not here discuss the nature of the eye in *Carabus*, the structure of which is, I consider, an insuperable hindrance to its appreciation of colour. But I will touch on what we all know from a very casual observation of the habits of the lower animals. We know, that when the season of mating commences, there is an eagerness of object, which leaves little room for discrimination of any kind. Those of us who make companions of the canine family know this, and Lepidopterists have seen moths, fresh from the pupa, almost mechanically entering on their relations together. And when bright-coloured males of birds combat in the spring, they are fighting for *a* female, not for the privilege of selecting a favourite in a series.

The *Buprestidæ*, although of a more recent date than the oldest vegetation, are found in the fossil state, and there are, I believe, evidences in well-substantiated facts, that this family are amongst the earliest of known beetle forms. What happens, then, in colour in this family, a family we know has passed through epochs of evolution? Do we find in them protective colouring? In the *Buprestidæ* we have diurnal beetles of the most lovely colours and unclouded lustre, and a vast time can be allotted to them to allow their brilliancy to culminate in its present perfection, and in no other group do we see less of that which is called protective colouring, for they excel in conspicuousness all other beetles. I believe, although I cannot affirm it on my own observation, that *Buprestidæ* infest palms; and palms are older than any flowering shrubs, and, with the exception of a *Curculio* or two, hardly support any other insect-life. *Buprestidæ*, too, are of very simple structure—a cylindrical body without any particularly specialised parts: all this points to an antiquity at least equal to any known in other groups, and in no other family do we see less protective colour. It may be urged that the larvæ feed in the interior of trees, and are protected from enemies

which might assail them; that the imago is short-lived, and soon lays its eggs, so that protective colours are not needed; but all I wish to notice is the absence of protective colouring. It is true all are not brilliant; the Madagascar *Buprestidæ* especially are dull and of peculiar form, but the species of that curious fauna are, I believe, not much exposed to the sun; they live under the thick foliage of the jungle. Some of them are brightly metallic beneath, like *Geotrupes hypocrita*, to which I shall refer. The *Phytophaga*, again, are another group remarkable for brilliancy, and have been modified gradually with their food-plants, and there is little or no sign of protective colour in the family. Their tarsi are an instance of beneficial form; certain joints are enlarged, and, absorbing others, have reduced the normal number, giving the feet more power for clinging to plant-leaves and shrubs. Use here has enlarged certain parts, just as the village blacksmith acquires great power in the muscles of the arm. And, while Nature was thus busy modelling and remodelling their form, would not protective colouring also have been given, if it was in any way conducive to the welfare of the species? I think the external physical conditions of life are a much more potent factor in creating form than is usually supposed, for it is these conditions which cause the *Phytophaga* to *want* to cling before the broad tarsus develops.

If we put aside gems and minerals, the colours of which need not be noticed here, the oldest substance or material existing, which throws off, what is called bright colour from its surfaces, is that of living organisms. For their hues are transmitted down through generations and generations from a remote ancestry, not necessarily hereditary, as understood in relation to the sexes, for fuscous ants produce yellow ones; but by reason of an unremitting action of light waves on the surfaces of their outer teguments through all their modifications from the dawn of their existence. The most prevalent colour in the world is that realised in the vegetable kingdom, for in all grades of vegetation a ruling verdure prevails over all other hues, and vegetation is, to say the least, older than the coal-measures. To sustain and render permanent that greenness, which we see so universal in all climates, and under all the possible and most variable physical conditions which exist in the

globe, must there not be some persistent, ever-continuing action, which never in all the vicissitudes to which plants are subject relaxes, or suspends, its active operation? And what is this but solar rays, the comparatively unchanging action of the sun? Throughout ages the surface of the globe, with its climate and every physical condition in it, has been changing, yet we believe the foliage of the coal-measures was green.

A simple evidence that greenness in vegetation is owing to light is, that a plant hidden away in a dark cellar grows rapidly and becomes blanched, that is, it ceases when brought to the light to reflect from its leaves green rays, but the relatively permanent character of its organisation soon causes the normal colour to appear on re-exposure to light-rays. Light, while it checks growth in vegetation, has an effect on the material substance of it, and causes it to absorb those rays which make it appear green to us, but when removed from the light it becomes white. Feeding on vegetation, the older organism, as compared to animal life, are green caterpillars, and the greenness of these larvæ, by analogous argument, may be set down as acquired under the same natural processes, for the influences which have acted on the vegetation have been sufficiently continuous on the larvæ to cause them also to absorb the same rays. There is no reason why a caterpillar having a system which can admit light, after the manner of a leaf, should not permanently become green under the same conditions as a leaf, if an adequate time be accorded to it, for light is a movement which is of sufficient energy to act mechanically on such substances as those of which both consist. And from the universal greenness in the vegetable kingdom we see Nature has a general tendency to display this colour in the flora of all countries; and we see it also in other organisms through which light can pass in a like manner as through leaves; and of these I shall speak later.

At a watering-place this summer I saw the shingle of the beach left in ridges by a receding tide, and these ridges were, as any one could see by their continuity along the shore, the result of the wave-movements of the sea. When it was rough the ridges were separated by a wide dip, and in smooth weather the dips were nearer together. They were the result of wave-movement, and corresponded to the motion of the water.

Later, as the tide ebbed out, the more yielding surface of the sand was exposed, which, being flatter than the beach, and the tide on the wane, the ridges or ripples were much smaller and closer together, and, finally, several ridges and dips could be measured in a span's length. In the 'En. Brit.,' under Light, p. 609, I read, "The scales from the wings of butterflies owe their brightness to a delicate ribbed structure"; and I believe that light has acted on the wings of Lepidoptera and other living organisms in a very delicate manner, but in an analogous way as the sea did on the sands. The most beautiful butterflies soar with wings stretched out horizontally, and float backwards and forwards under a vertical sun; while the brown dingy species, flit along hedgerows, with wings half-closed, catching light-rays at all sorts of angles and direct rays very intermittently, and the structural ribs of their scales are modified accordingly. Think of the ripples on the sand and the form they would take in an uncertain, changeable movement of the water; retain in mind the subtle movement of light, the exquisite delicacy of the scales in a butterfly's wing, and the multitudinous angles the superficies of the wings present to the sun during flight, and we can perhaps account for the varied hues of Lepidoptera. The flight of a Skipper would cause its scales to assume a different structure to those in a Blue, just as a cross movement in the sea would disturb the ridges on the shingle. The same theory will explain also the sexual, generic, and family colours of Lepidoptera, for they are dependent on and regulated by the positions of the insects when at rest or during flight; it will explain why *Noctuæ* have different coloured under-wings, as light only reaches them after passing through the primary ones; and why *Geometræ* have wings concolorous, as all four wings are exposed. Remarks later on regarding the atmosphere will apply here. And it will show us another thing more puzzling still.

When insects depart from a type and then again turn towards it, we see forms and colours which surprise us with the similitude they bear to other insects now placed in a classification based on structure, in distant families, and the inquirer is disturbed in his calculations of their affinities. For in this way insects which resemble each other in form and colour are often apparently further detached than others less like them. Now we know that

Pericopis is a moth, and that *Heliconius* is a butterfly, the separation between the two in classification is wide indeed! But the species, after separating, come together again, inhabit the same glens, live under the same physical conditions, assume the same position in flight and at rest, and, by steps which I think we can trace, similarity of colour and pattern of wing follow. For they both still possess in a certain degree the same internal physiological organisation with which they were endowed before their separation, and this, too, in a comparatively little modified state. It is a point which confirms this view, and carries conviction to my mind, that species of this kind are always found living together, and are subject, therefore, to the same physical conditions. And Nature, acting on a physiological organism not very dissimilar, can produce no other result but similarity of appearance and structure. The conditions I refer to are external conditions, which would, in the ordinary nature of things, act first on the outer characters of a species,—wings, colour, antennæ, and so forth,—while a longer time would be required to modify the more vital parts. Many allied moths resemble the butterflies they associate with, species by species, and I think the above is the explanation of the phenomenon. In the Coleoptera there are also numerous instances. If an African moth resembled an American butterfly, the case would be different; but, I should still say, that similar conditions of life produced similar results in both continents.

After thinking what insects have passed through, it is natural to turn to the future. But in that we must not assume that existing species can be modified only by a process similar in kind to that which produced them, for then we could not assign to them any continued existence; but this we may say, that all forms, even those hard and comparatively permanent species now existing in Europe, will through all time continue to be modified under the causes which will be produced by agencies now in operation. We cannot bring the same forces to bear on our domestic animals which Nature has used in forming the parent stock. All we can do is to compare domestic modifications with those variations which are now taking place in wild animals, and this is exceedingly difficult, because the rate at which modifications proceed in the two is so different.

I must refer again to the *Carabidæ* and *Buprestidæ*. In the first family we have noticed that bright species occur in the Spanish mountains in a brilliant sun of a dry atmosphere; colour here is the effect of direct sun-rays, because it is the upper surface alone which is brilliant; *Carabidæ* being on the under surface black. And another thing requires special notice,—the elytra are most frequently of a different tint to the head and thorax. As the insect rambles, the abdomen is carried on in the same parallel line, but the head and thorax move as the animal feeds or runs, and they present to the sun a different superficies, such as has been noticed in the flight of butterflies, and the result is two distinct colours. Many of the *Geodephaga* have the elytral margin alone brilliant, and this is the surface which receives the full force of direct solar-rays; and it is in this spot that colour in many species evidently begins, for even in bright species colour is brightest there. In the second family we find the under surface of the body is as brilliant as the upper, except in the Madagascar species, when the under surface has the greater brilliancy.

Professor Tyndall tells us:—"The heating of the tropical air by the sun is indirect. The solar beams have scarcely any power to heat the air through which they pass; but they heat the land and the ocean, and these communicate their heat to the air in contact with them. The air and the vapour start upwards charged with the heat thus communicated to them." Here is an upward movement, and in the tropics where this takes place we find insects which sit on foliage are brilliant beneath, as the heat-rays, moving upwards, affect the under parts of the beetles in the same way as direct rays affect the Spanish *Carabi*. There is nothing essential in the direct sun-rays of the tropics to create colour quicker or in a greater degree than in temperate zones, but the heat of the air and the moisture there promotes a more vigorous growth in the organisms on which it acts; and perhaps the sun-ray sculpture is rendered permanent sooner there. For there is little doubt that species are less permanent in the tropics than in temperate zones; that is to say, they are more impressible and liable to quicker modification in the same ratio as their vital energy is greater. The winter in our own latitude reduces the growing period of organic life by perhaps one-half, and the feebleness of growth during the other six months lessens it much more.

Regarding the metallic colours of birds, the same mechanical action of the sun's rays seems to produce them. The downy feathers of the brightest are almost colourless, for the light-rays touch the exposed ends of the feathers only. If a swan were dipped into a tub of scarlet dye it would produce a similar effect, and leave the down white. In the humming-birds and swifts, which are continually flying during the daylight, the colour of the under surface of the wings and the sides of the body they cover when at rest corresponds to that of the upper, and the same would occur in dyeing a swan if during emersion its pinions were opened. As the sun-birds fly both sides of their wing-feathers are exposed to the same rays or waves, and the same impressions or ribs are stamped on either side of them, for during the day they are ever on the wing. Birds which perch much have colourless under sides to their wings. Let the humming-bird be thought of in the hovering position of sipping honey, or coquetting on a twig in the midday sun: just as the gorgeous butterflies soar and catch the vertical or direct rays, such, in fact, as appear necessary to produce the right ribbed structure for metallic brilliancy, so these birds are incidentally, by their position, so placed as to be struck by the most direct rays in such a manner as to give brilliancy and metallic colour to the head, breast, &c. The tail is lowered in some species, so that the breast and scalp catch the full power of the sun, and the wings are struck obliquely like those of the brown flittering, or more retiring, species of Lepidoptera. The sun-rays, of course, are not affected by the movement of the wings, but by their varied positions the wings are impressed differently. To appreciate fully the extreme delicacy of the ribbed structure, produced as I think by the sun, is almost impossible; but to see its effect we must face the birds with our heads between them and the light, and then the greatest brilliancy appears, for at any other angle the sculpture is different, less fine, and the brightest colours are lost. It is the same difference as if we looked on the sand from the Folkestone beach, or saw the ripples while wading in the sea. A few of these birds are metallic in a reverse attitude, and it is probable their habits of flight or position in rest are only approximate, for in our classification they stand in different genera. Some have long tail-feathers which float in the air according to the move-

ments of the birds, and these feathers are very beautiful. In the humming-bird, *Orcotrochilus pichincha*, the feathers of the breast are filiform and non-metallic, but in *Topaza piza* the whole breast is clothed with lamelliform feathers, and it is highly metallic. In *Amazilis* the feathers on the rump are laminated and metallic. In others there is another form of feather, a feather, in fact, of filiform structure, which has commenced to be flattened out; here there is metallic lustre, but not the brilliancy of the short lamelliform feather. How far light may be the factor in creating the general form of the feather is a matter of the greatest interest, for it is significant that in birds it requires a lamelliform feather and in butterflies a surface free of hair or down before great brilliancy appears. White birds and white animals belong, generally speaking, to the temperate and northern zones, and the whiteness of a swan may arise from the structural benefit attending that whiteness. The oily substance on the feathers which enables aquatic birds to rest in the water may receive the impressions from the rays, and thus prevent them from becoming permanent on the feathers. Perhaps there is a special absence of this oil on the metallic feathers of the mandarin duck. The swan has the habit of putting his whole neck and head under water, but I doubt if this is so much the habit of the duck tribe when there is brilliant plumage on the head and neck. A laminated feather could not retain oil.

I do not like to refer to tame birds, but the rock pigeon is close to our domestic one, so I take the last as another example. Pigeons strut about the ground picking up grain, moving the head and neck-feathers with a quick undulatory movement, which is almost incessant. The head and neck-feathers meet sun-rays at every angle, and the beautiful tints are diffused, not localised as in the humming-birds.

It is almost a relief to turn from the contemplation of these exquisite structures in birds and butterflies to think of the bark of a cork-tree, or the even rougher hide of a rhinoceros. But in turning round sharply, we see the more clearly, that sun-rays cannot materially affect rude structures like these; and we miss at once what we call beauty of colour. And what do we learn? We see that when Nature has provided the surfaces on which solar-rays can act, metallic brilliancy must come, for it is simply a matter of structure.

When we have a rare plant of tender and delicate foliage, we keep it carefully under glass that the ruder elements may not injure it. Nature, as she prepares the delicate upper surface of a *Morpho*, preserves it from exposure. While direct rays are playing on it, its horizontal wing catches their full force, but in rainy or dull weather the insect rests with closed wings. During the night and the cloudy hours of the day the superficies are thus kept from any influence which might injure their fineness, or hinder their attaining it, for the atmosphere would act in opposition to solar-rays by effacing their sculpture. If butterflies rested like *Geometræ* they would be coloured like any ordinary species of that family. If humming-birds went to roost on exposed twigs I think it would be impossible for them to retain their brilliancy. I do not know their habits in rest, but I have seen the sun-birds of Asia, which have been produced under allied conditions of life to the *Trochili*, retire in cloudy weather. Bright-necked pigeons lodge in holes of rocks. The harder texture of a *Buprestis* can stand nocturnal exposure, but perhaps they have taken longer to attain their colours than a butterfly, and we believe the first is an older form.

From my point of view neither the atmosphere nor any of its components are the cause of bright colour, for it obliterates it. The surface of the hardest granite loses its hieroglyphics by decomposition produced by air. An organic being can retain trivial marks on its most delicate parts through an hereditary system of registration. I think of *Abax striola* as that of an insect which has either passed through the metallic stage, or as one which is attaining it; most likely the latter. It is a very singular thing that the *Hololeptini* are all black; they are diurnal and highly polished. Perhaps these, too, like the cave *Trechi*, are in a transitional position; perhaps the mucous matter they bury themselves in may act like the oil in birds, as suggested here, and prevent them from becoming metallic. This last idea approves itself to me, because in *Teretrisoma* and *Pachycræus*, we have bright diurnal forms of *Histeridæ* which keep themselves free of exuding sap.

Light-rays, as they act on Coleoptera and other insects, require a long time to perpetuate a ribbed structure, but as it is formed by little and little it becomes hereditary in the same way that we know striæ and punctures are.

And the question of the relation between the more palpable structure of a butterfly's wing and the ribbed structure of the scales, which throw off the colour, evidently opens up at this stage of the inquiry. For it seems very possible that light is a powerful factor in modifying the membranous anatomy of a butterfly, or even the harder wing-case of a beetle. I am led to this remark especially now, because I think pigmentary colouring in insects is also due to solar-rays.

In all varieties of man the palms of the hands and the soles of the feet are not exposed, and, like the downy feathers in birds, they are pale in all races. The colouring substance in the cuticle of the negro is said to be a protection against malaria, and as it has originated in an insalubrious climate, which is fatal to Europeans, it seems to me that the ungenial vapours of the swamps in Africa is the condition of life which produces it. But the domiciliary habits of man remove him somewhat from the influences of those laws on which we can with safety rely in our discussion of wild animals.

In an early page of this paper it has been said that nocturnal insects may be black because they are not influenced by the direct rays of the sun, and we have also seen that Spanish *Carabi*, although as brilliant above as the brightest of the *Buprestidæ*, are black beneath. Blackness to a nocturnal beetle is not more of a protective colour than scarlet would be, in fact even less ; a scarlet geranium is notably one of the first flowers at twilight to be subdued in colour, and blackness in a *Blaps* would make any stray specimen during daylight, more conspicuous to a sparrow, than if it was banded with blue and gold ; the intense blackness would, in fact, sharpen the outline and render it visible at a long distance. If protective colour were beneficial to nocturnal species, would not a large portion of the *Tenebrionidæ* be grey or variegated ? In Heteromera, which roam at night, we have more diversity of form perhaps than in any other family of Coleoptera, showing that they have been greatly subjected to modification ; so much so, that we can almost think of them, as the nocturnal remnants from ancestors in all the other families, yet they are black, and this means that when they can be seen they are conspicuous. The most inconspicuous or protective colour for any insect is grey or blue-grey, yet in a bright clear mountain atmosphere in Spain, or in the glistening

sunshine of the tropics, in places, that is, where it would be most beneficial, such concealing absence of hue is altogether lost. So before we can say this or that is a protective colour, it must be proved that the cause of colour in the animal is not the same as in the plant or object it simulates. And should the animal be a larva, which we believe is of more recent origin than a leaf, we must show that the two, have not been together side by side long enough, to acquire the same tints, by the same processes. It might be said, but I think incorrectly, that blackness arises from the invigorating energy derived from warmth, as blackness absorbs heat-rays, but in that case it would not properly be a protective colour, but an incident in another line of evolution. I have noticed that *Damaster*, seeking for warmth, becomes diurnal, and this, I think, is the natural course for an insect to pursue. I think of blackness as a structure formed by heat-rays, and that beetles are black because from their habits of concealment they are not affected by direct rays, nor by the air like *Noctuæ*.

This will help us to see why *Carabi* are black beneath, for in their dry mountain habitat there is no upward movement as in the tropics. On their upper surface they are sculptured by the direct solar-ray, and their body is the tegument of a nocturnal insect. Wherever there is foliage there is also a certain amount of moisture, and insects, such as *Rhynchites betuleti*, owe their colour to it, and *Carabidæ*, such as *Colpodes* and *Lebia*, of arboreal habit, are not black beneath. *Elaphrus* also, which inhabits a damp swamp, is wholly bright. I must call to mind too, here, the fact, that two arboreal species of *Calosoma*, *scrutator* and *aurocinctum*, found in America, are brightly metallic above and beneath, and that the body in *sycophanta* is wholly black, and I believe the last is terrestrial. *Geotrupes hypocrita*, I think, is bright beneath for the same reason that the Madagascar *Buprestidæ* are, for the fermentation going on in their habitat gives an energy equivalent to the uprising heat-rays of the jungle-forest. If a hand is held out over decaying matter, warmth is felt, something like that which strikes an open palm held out to the sun.

The brightest colours which exist in Nature are those which we see in insects and birds that are the most exposed to the direct rays of the sun, and the brightest and most metallic parts of those birds are those which

catch these rays in a greater degree than others. In the humming-bird it is the head, throat, &c.; in the butterfly, the expanse of wing; the one has feathers and the other scales, and these are both of that substance which enables them to take impressions from the sun. The light, direct waves from the sun are the most subtle and delicate of all solar-rays, and produce the finest ribs. Spots and ocelli in Lepidoptera seem to me raised places and depressions in the wings, or are sometimes owing to the different make of scales in those parts. The lamelliform feather of a humming-bird is not very different to the surface presented to the sun in the wing-case of a *Buprestis*.

Opacity of substance is almost universal in the bodies of terrestrial animals and plants, but I will mention two instances of pellucidity. First, the blind *Rhyncophora*, discovered within recent years under stones in the South of Europe, *Raymondia*, *Alaocyba*, *Troglorrhynchus*, &c.; and, second, ferns of the *Hymenophyllum* group. The first live in perhaps absolute darkness, and are never touched during life by light-rays; the second are only subpellucid, and live in the shadiest parts of forests, where they are subject to indirect rays. Cave insects, such as *Trechus* and *Polystichus*, are testaceous, and seem to me to be on the road to pellucidity, but have not yet had time to assume it. If we knew nothing of the laws of light, it would perhaps be natural to look for a general tendency to transparency where the sun's rays are least obstructed, but in reality we must for this turn to aquatics, and look into a pond; there we see numerous examples of it. The larvæ of Neuroptera and *Libellulæ*, shrimps and fishes, are pellucid, because light-rays are diverted from them by refraction, for light glances off sideways on touching the water, and the ribbed structure essential for colour is, generally speaking, absent in these animals. The fish, however, which would feed on the transparent larvæ have eyes formed to see their outlines and movements in the water, just as they have a tail and fins for swimming, and pellucidity in aquatic larvæ is not protective any more than the greenness in the case of *Daphnis nerii*. Light also moves faster in the air than water, so that even if rays acted directly on the integuments of the shrimps, the effect would be less powerful.

The sooner we sift thoroughly the protective colour

theory, the sooner we shall discard it, for a better knowledge of the cause of colour in living organisms will dissipate it.

Nature has no multiform manner of working; her energy would be weakened unless based on uniformity of action, but she obtains many ends by the most simple means, and as solar-rays appear to produce metallic colours in insects, so air and its components seem to produce scales and feathers. *Nosoderma* has a weather-beaten cuticle, and so has *Anthribus* and other beetles, which stick to trees in the daytime like *Noctuæ*. The under side of a butterfly is weather-beaten, while we have seen the upper side is protected from nocturnal vapours and bad weather. What happens to the butterfly beneath happens to the moth and beetle above—its surface is weather-beaten. It is the under surface of the moth which would become brilliant if exposed to the sun. In many Lepidoptera the upper margin of the secondary wing, near the base, is covered by the lower margin of the primary wing. The upper surface of this part, the costal margin, has neither colour nor scales. If there were no scales on the under side it would be transparent. This small space is neither sun-struck nor weather-beaten. Attrition is absent. We have said that where direct solar-rays can act permanently on feathers and scales, colour must come; and where air touches the cuticle of animals, there are scales, feathers, and hair. There are no scales or plumes on the wings of insects when the surface is protected from the air, nor is there bright colour in a surface not touched directly by the solar-ray. The under wing of a *Dytiscus*, or a *Lucanus*, is kept from air and light, and it is transparent, that is, it is neither coloured nor scaled. Air, apparently, so universally gives hair and feathers to animals that we think that it is necessary to the welfare of the creatures so to be covered; and it is so, since they have been modified to their present form. But, if air has caused scales and feathers, it is only by acting on a physiological structure prepared by previous modification to be again modified by its power, after the manner here indicated regarding light. For as colour will come on a structure suitable to retain it, whether it be the elytra of a beetle or the lamelliform feather of a bird, so hair will come on animals and feathers on birds through the action of the air, although they may be of no original

affinity, or one so remote, that the links of their relationship are lost. As there appears to be a photoplastic process, so there appears to be an areo-plastic process. Wild animals have most hair on those parts most exposed to the weather, just as butterflies have the brightest colours in parts most exposed to the sun and most protected from the elements. The colour of the lichens agrees with that of the *Aplecta tincta*, because they are both weather-beaten ; they seldom meet direct solar-rays, and could not retain the impressions if they did, by reason of their present structure.

The form of the lichens is not wholly dissimilar to the form of the scales of the *Noctuæ*, because both, being in the air, are free to develop in all directions. The under wing of *Catocala nupta* has flatter scales than the primary wing, as the upper wing lies over it. I should expect to find the costal margin of the under wing in *Noctuæ* freer of scales and colour than in a *Geometræ*, because the costal margin of the primary wing of the first is robust, and has nervures of thicker structure than the second ; and it is the costal margin of the primary wing which rests on the costal margin of the secondary wing. In *Geometræ* the hind portion of the primary wing, that is the thinnest part of it, rests on the costal margin of the secondary wing, and the protection afforded would not be so complete.

I exhibit here two butterflies, *Morpho* sp. and *Nectaria Jasonia* ; one has raised nervures, or, to return to the old simile of the sand, here are lateral ridges of rock or chalk, and solar-rays strike a surface unfitted to retain their impressions. In the first the nerves are very fine and delicate, and they permit the wings to close tightly, and the smooth surface is beautifully concolorous. Some butterflies are not brilliant in the wings near the base, as, when the wings are in a position of rest, they do not touch near the body ; the wings fit closest about their centre, and this is where bright colour first appears, or in the centre of the spaces between the nerves.

Examine a specimen of *Salpinx superba*, male ; this butterfly appears bright in the upper wing just in the part which is in rest most protected from the atmosphere. There is a good wide margin on all sides of it without colour. And then the nerves seem to confine certain spots, which appear spreading, to the centre of the spaces between them, for the nerves meet and press close, and

exclude the air, which would obliterate delicate structure on the interstices. The beautiful moth, *Urania*, from Madagascar is highly coloured on both sides, and particularly on the under surface, after the manner of the *Buprestidæ*, and doubtless from the same cause. I look on this moth as one of the oldest forms of Lepidoptera, though not so old as the *Buprestidæ*, for colour would appear sooner on its wings than on the harder elytra of a beetle. How Lepidoptera of this type of beauty preserve their colours,—and there are numbers in the tropics,—I do not clearly see. *Papilio thoas*, too, is worth looking at, as it exhibits a type of pattern common in its family. The pattern of the wing seems regulated by aero- and photo-plasticity; the yellow band does not pass over the space which is open by the presence of the thorax during rest, and, if the idea of this is carried in mind, it is curious how soon the eye catches its influence as a cause of pattern. These factors are acting in all quarters of the globe on all Rhopalocera; so there is no reason for seeking affinity where we discover mere similarity in pattern. When butterflies show signs of bright colour in the concavity of the hind wings, it is because this part fits tightly over the abdomen when they rest.

We are fond of speaking of the simplicity of Nature's operations, yet do we always see how really simple it is? Butterflies and birds living in the air seem to me clothed by it, and they are made beautiful by the solar-ray which passes through it. The complex nature of living organisms is the result of modification through immeasurable periods, not from a complex physiological economy at birth.

When we observe an exceptional structure or colour in an animal, and see the peculiarity repeated, again and again, in creatures which are so wholly different that we can only see this peculiarity to connect them, we are right in thinking there is no real affinity, or one exceedingly remote. But we can trace the origin of the exceptional form or colour to the same source, for we find it everywhere fulfilling the same service. We must, however, look at things closely; we must not say, that the colour of a *Carabus*, agrees with that of a *Buprestis*, because their tints do not absolutely correspond, and we know something of the reason, as one originates in a clear, dry, mountain atmosphere, and the other in the hot steamy vapour of an undrained jungle.

An instance to show my meaning in colour and form may be given in *Pterostichus picimanus*, *Pedius inæqualis*, and *Achenium humile*, which live in the crevices of clay banks and become piceous, which is a slight indication of a turn towards pellucidity, as they never run in the sun; and they are all flat to enable them to pass into chinks. *Pedius inæqualis* can escape *Pterostichus* by going into the smaller cracks, and the *Achenium* avoids both by passing into the smallest crannies. The flattened form originates in the common benefit to each while inhabiting crevices, and colour follows from the nature of their habitat. The *Pedius* is not necessarily piceous because its allies in the South of Europe, which run in the sun, are coppery or metallic. Another case may be selected of form only. *Lebia* and *Drypta* are both truncatipennes; the first sits on foliage, and continually flies either for pleasure or to escape an enemy, and the shortened wing-case assists this movement. I have seen *Drypta* in great profusion; overtaken by a sudden flood, it will run up a stem of grass or reed to take to flight, and it is in this genus again, we see the truncate elytron, and the use of it. The necessity or benefit of quick flight shortens the elytra very commonly in Coleoptera. The shortened wing-case in the *Staphylinidæ* is different to that in *Lebia*, and arises apparently in another way (see 'Ent. Mo. Mag.,' 1881, p. 138; and 1882, p. 213). Instances such as the above can be multiplied without end, but there is a very striking one in a *Curculio* and a *Staphylinus*. *Balaninus* buries its rostrum in a nut, and the antennæ up to the elbow go with it. In this position the remaining joints play about the eye and fulfil their purpose there. When *Cryptobium* feeds the head and mandibles are thrust into the object they delight in, a decaying worm, or anything else, and the long basal joint brings the small joints of the antennæ behind the eye. The common origin of the long joint here is, I believe, the dimness of sight in both animals, which necessitates the feelers being brought back. The varied species of *Balaninus* show what immediate modifications the genus can go to. The long joint of the antennæ in the two genera shows that like wants, arising in like conditions, give like form. In *Rhynchites* and *Apoderus* the head is not inserted into their food-plants, nor are the antennæ elbowed.

Perhaps it will be said that these are interesting facts

about the *Drypta* and *Balaninus*, and that they are such as should be brought forward; but do they cover the conclusions? I am merely applying to details in structural and other peculiarities what we learnt in our childhood: an eye is for seeing, an ear is for hearing. If we are frustrated in an effort to discover why a glowworm is phosphorescent, let us examine a May-fly (*Teloganodes*), or a centipede, which is luminous, and if we discern a reason for its existence in either one or the other, it will lead us to the cause in all. If we say a leg is for walking we err; we must say a leg is for moving. If we see a brown beetle clinging to brown bark, we do well to say the brownness in both arises from the same cause; but if we believe in the protective colour theory, we must say that one of the primary uses of the clinging foot to a brown beetle is, to enable it to cling close to bark where its concoloration will enable it to escape extermination. I believe the clinging tarsus is an independent modification arising from habit, and that colour is a modification dependent on that structure only so far as it will come to any creature which will inhabit similar situations.

In colour, let me give three more examples: a leaf, a *Sphinx* larva, and *Cassida viridis*. Light affects these in the same way, or nearly so, because they are not very dissimilar in substance, when considered merely in their relation to light. Certain light-rays can pass through them in a similar way, for they are translucent, and this causes a sameness of colour. The *Cassida's* body is black, for it is of a different texture to its case. In Ceylon, and in other places, are certain Reptilia, snakes, frogs, and lizards, which possess skins of marvellous delicacy; they are semitransparent and admit certain light-rays to pass through them; their whole physiological structure, too, is such that light is admitted into their material substance; they sit on foliage, where they are exposed to all the waves of solar-rays and heat, just as leaves are, and they are green. But remove them to a trunk, shaded, or partially so, from the direct rays of the sun, and the reptiles become mottled or brown, as the case may be, for their mutations are too variable to describe; their colours differ at each hour of the day, and are affected by almost every passing cloud. Their material substance is such that they become green where *Cassida viridis* is green, and mottled where a *Noctua* is mottled.

If like conditions and wants produce a like form, what is more certain than an offspring should resemble its parent until removed from the conditions under which that parent lived? And it appears to me to be under impulses somewhat akin to these that hereditary form owes its origin.

Since writing the foregoing I have read Dr. Hagen's paper in the 'Proc. Amer. Academy,' April, 1882. The conclusion arrived at in this paper regarding colour is: "I am convinced," says the author, "that colour and pattern are produced by physiological processes in the interior of the bodies of insects." Dr. Hagen's observations and inferences are wholly different to mine, but Dr. Weismann is quoted, who believes that colour and pattern in caterpillars is "purely mechanical;" and this process is what I consider has been and is open to proof. Dr. Weismann seems to have confined his observations chiefly to caterpillars, because "they exclude sexual selection;" but if sexual selection is a factor (I exclude it altogether as regards colour) it must act through the imago on the ova and all the intermediate stages of an insect, for in one sense the imago is only a form of puberty.

I now return to the original subject of this note. Motschulsky, in his diagnosis of *Damaster rugipennis*, says, "in ♂ tarsis anticis articulis tribus primis leviter dilatatis, subtus spongiosis et biseriatim setosis," and *D. Fortunei* also has the tarsi of the male with three joints dilated and padded beneath, and these two species bridge over the distance between Kollar's genus and *Carabus* proper. When Kollar published his species he only knew of the leptodactylous *blaptoides* with long mucrones, and he thought these sufficient characters on which to found a genus. In *D. capito* we have a species with slender tarsi in the male, and obtuse elytral points in both sexes, and it is impossible now to consider *Damaster* any more than an endemic form of a Japanese *Carabus*. *Damaster viridipennis* I now know is the same species as *Fortunei*, Adams; the type of the latter is in my possession, and is discoloured by emersion in spirit, and the author of the species was not aware of the beautiful colour of fresh specimens. For the slender blue variety in *pandurus* I have noticed as occurring in the mountains of Chiuzenji, lat. 36° 30″, I propose the name of *cyanostola*; it is a form quite isolated from the parent

type, and corresponds to *Lewisii* in *blaptoides*, with this difference :—*Lewisii* is an offshoot of *blaptoides* rendered smaller by the dryness of the area it inhabits, as compared to the district of luxuriant vegetation in which *blaptoides* dwells ; it is not a variety owing to a dry mountain atmosphere, but a variety pertaining to a dryer, lighter soil, of the same elevation. *Cyanostola* is a *pandurus* which has wandered up from the coast-level, where snow rarely lies, to an altitude of 6000 feet, where snow remains six months in the year. Alpine insects, which crawl out from the snow to enjoy the bright sunshine of an instantaneous spring, often acquire in it, as we have seen, colour which enables them to vie with the gorgeous insects of the tropics. If in the latitude (33°) of *blaptoides* there were high mountain ranges suited to *Damaster*, we should probably have a coloured *blaptoides*, but the altitude to produce the necessary lower temperature would have to be greater than that in latitude 36° 30″. As it is, the only mountain near to Nagasaki of sufficient altitude is Unsen, 7000 feet, but this volcano is merely a conical mass of lava thrown out by recent eruptions, and is at present unfitted to nourish either vegetation or large insects.

Having said then that the characters are insufficient on which Kollar relied to separate *Damaster* and *Carabus*, let me examine *seriatim* the ordinary forms of the genus, and note their differences in the various latitudes they inhabit, for we shall find that they too follow the same line of modification, and, under the same climatic and thermal changes, exhibit similar variations to their allies.

In the first section there are five species close together, and their connecting history appears to be this :—

Carabus Dehaani is a large dark-coloured species of nocturnal habits, confined to the warm area south of the Biwa Lake. It is abundant, and constant in form and colour, from Kagoshima to Kioto, a distance of 400 miles, and also occurs in Tsushima and on the south of the Korea, which gives it a fairly wide range, and seems to indicate that it has in all probability allies in Eastern Siberia.

Carabus insolicola is a modified form of *Dehaani*, and, like it, does not vary; but it is diurnal and bright-coloured. It has equal possession of the colder latitudes, reaching from Biwa Lake to Awomori, an extension

of 500 miles. The two insects are locally separated from each other by the Biwa Lake barrier, north of which the climate of Japan is much colder, owing to the higher mountain ranges which run up the centre of the main island, and, partly because there, the effect of the Kurosuwo, or gulf-stream, on the general temperature is lessening as the stream begins to pass away eastward into the Atlantic.

Carabus Albrechti is another abundant species, a scion branching out of one of the above, and is a more prevalent form than either of them, for the climate permits it to retain its specific characters, subject to very slight variation in all the islands, and it is spread over a space equal to 1300 miles. Yet still, even in this species, the southern specimens can be distinguished from those of Hokkaido by a slightly more graceful outline, somewhat more slender legs, and a rather less coppery colour. From the southern type of *Albrechti* emanates *Maiyasanus*, which is limited to a comparatively small area, and then occurs only at considerable elevations. The head-quarters of it are in the Idzu Province, but I have specimens of it from Oyayama, near Kumamoto, in Kiushiu; the distinguishing character of it is the constant pale tibiæ, while all other known *Carabi* in Japan have dark-coloured legs.

Carabus Yakoninus is an offshoot from *Dehaani*, and we find it existing only in that part of Japan where the parent type is abundant; both reside side by side, and if intermediate varieties could be procured the short distances between them would be bridged over. But I failed to find any form of it in the north with *insolicola*, nor could I obtain any varieties in the south. The most notable feature of this transitional species is that it is well marked in colour as being nocturnal, and therefore, like *Dehaani*, suited to the mild climate of Kiushiu, where it is found.

In another section of the genus, *Carabus Maacki*, similar variations appear. A series from Tonasawa, lat. 35°, is black; these represent *Carabus telluris*, n. s.; while specimens of Moriwitz's type from Sapporo, lat. 43°, are distinctly green and metallic.

In a third section, represented by *Carabus procerulus*, which occurs from Kumamoto to Awomori, I found near Sapporo an allied species, *arboreus*, n. s., which is more robust and less elegant; the climate in this species

affects form only. These two species run parallel to *Damaster blaptoides* and *Lewisii*, for both are nocturnal, and present to us the first effect of thermal change, *viz.*, a structural modification, such as commonly occurs in the flora-world when at the base of a mountain plants show a vigorous growth and attain a large size, while specimens higher up the mountain gradually diminish.

Mr. Pryer has told us in a recent paper that certain thermal or "temperature" forms of butterflies occur in spring and others in summer, and that the forms are regulated by the temperature in which the larvæ live. And this is not hard to understand. In Japan spring forms of Lepidoptera come from larvæ fed up on autumnal foliage, on leaves, that is, which are fully matured, if not partially desiccated; but the summer broods are nourished on the succulent vegetation of early summer. The nutritive properties in plants vary as their growth is vigorous, or otherwise; hence the small mountain varieties of summer agree with those of the spring in the valleys. Larvæ reared on a patch of poor soil in the midst of a fertile valley would give a corresponding result. In the tropics the secret of the "luxuriance lies in the copious rain," as I said, in August, and the large size of insects in the tropics is owing to their association with, and dependence on, the flora, and the conditions which affect both alike. A collection of British beetles I can store in a cabinet of fifteen drawers; a collection containing the same number of species from a country even as far north as Japan occupies forty.

I believe I have traced here in *Carabus* the same lines of variation which I noticed three years since in *Damaster*, viz., that a robust or stunted form is an earlier stage in thermal modification than colour, colour appearing only as an insect requiring warmth becomes diurnal. The discovery of the beautiful *Carabus Gehinii* in Hokkaido has introduced into the fauna of Japan an entirely new phase of diurnal *Carabus*, and, although this species at present stands apart from the other members of the genus, we cannot fail to observe that its colours are subdued, and by analogy we can anticipate the finding in Saghalien of northern affinities which will be as bright as the European *auronitens*.*

* Mr. Bates has just received this form in a fine new species from lat. 46°.

It may be suggested that if what I have said regarding sun-ray structure is correct, the matter may be proved once for all, by measuring the striæ or ribs on a scale or feather. For we know the lengths of solar-rays, and if the striæ correspond with them, this evidence may be accepted as a proof of their origin. But "a common sunbeam," says the author quoted, "contains waves of all kinds,—besides those which produce light, the sun sends forth incessantly a multitude of waves which produce no light. The largest waves which the sun sends forth are of a non-luminous character, though they possess the highest heating power. The lengths vary from about 1-30,000th to 1-60,000th of an inch." Any structure, therefore, produced by the direct solar-rays would not, even if the object impressed were rigidly stationary, tally with any particular measurement. Yet with this, it would be a test of no mean value to measure the colour-giving striæ of *Geotrupes hypocrita*, and compare them with those on the under surface of *Polybothris*, and these again with the striæ on *Carabus Hispanus* and *Pterostichus metallicus*, for the sculpture should not be so fine on the first and second as on the two others. *Geotrupes auratus* is an insect on which both kinds of striæ are found, one on the upper, the other on the lower surface; the first reflects red, the second golden green, and these colours closely agree in their respective parts to those seen in *Polybothris* and *Carabus*.

Here I may again call attention to the peculiar geographical position and varied climates of Japan, to which I formerly referred in the note on *Damaster*, for it enables us to trace in the islands, more clearly than any other area of the globe, the climatical influences which everywhere multiply species, and give so much diversity to the faunas of the world. And it necessarily follows that allied influences are at work on the great continents of Asia and of Europe, but why do not the characters here spoken of reveal themselves as conspicuously in the *Carabi* of the European catalogue? In Europe there are broad areas with lateral mountain ranges, and species are not forced to extend themselves solely to the north or to the south; and continents admit also of migration from east to west and from west to east, and early divergent geographical forms would mingle together and after a time return perhaps to the home and habits of their predecessors. Thus, as generations slip away, the

simple history of climatic and thermal modification is lost, or at least so far obliterated that we cannot easily define the limits to which it goes, although probably in the earlier stages of divergence the characters were stamped on the species in the same clear manner which we see still existing in the Japanese members of the family.

For the sake of following out the system employed in the earlier note (1879), I have said that *Damaster* became coloured, &c., as it approached the north, but it does not affect the general argument if it has spread the other way. *Carabus* is known to be a northern genus, and as *Damaster rugipennis* and *Fortunei* more nearly approach the type than the others, it is of course probable that the southern species are those which have been modified most, because they have been subjected not only to the changing conditions of the globe generally, but by migrating southwards they have passed voluntarily into a subtropical region.

If eventually we do not find in the north a coloured species allied to *procerulus*, I am inclined to think of it as a recent divergence, a species now in the act of spreading, and not yet differentiated into all the forms which Nature appears as a rule to lead to in this genus. For we all know that species have a very great tendency to inherit the form and habit of their kind, and to remain unaltered for some time; but at last the tension is too great, the conditions of their lives must act, the line breaks, and then comes the variety which originates a new race.

We cannot return to the time when *Damaster* and *Carabus* agreed better in outline and general contour than at present; we can merely trace their transitions by a general system of analogy, but in studying close varieties we study evolution, as it were, on the spot; we see divergencies in their most recent forms, and even perhaps as they are taking place. Seeing this then, may it not be well to but lightly censure "splitters" of species who are recognising transitional forms such as are as surely, and, presumably, as rapidly, departing from the type as any species since the time of the earliest insects? Names need not always be given, for we have passed the line where catalogues are useful,—we have reached the frontier, so to speak, of evolution, and beyond us lies the future in which Nature will not recognise

any arbitary classification; for then, as in the past, she will simply continue the inevitable modifications of surviving organisms through the means of the agencies which will result from those which are, as we have said, now in operation. And when that future shall have become the present the descriptive matter of to-day will not apply to existing forms, but instead of an abstract idea of the differences in insects, we may have a more certain knowledge as to their origin, and the working of those laws which both accelerate and control their development.

XXIII. *Descriptions of ten new species of* Nematus *from Britain.* By P. Cameron.

[Read December 6th, 1882.]

The Group of N. mollis.

A revision of my material in this distinct group of *Nematus* has enabled me to identify seven British species. I give below a table of those of which I have females, and have added a description of a new species :—

1 (2). Mesonotum smooth, shining, impunctate; antennæ shorter than abdomen, brownish beneath .. *scoticus.*

2 (1). Mesonotum punctured, opaque or semiopaque; antennæ black.

3 (4). Frontal area distinct; 3rd cubital cellule considerably dilated at the apex; stigma fuscous .. *mollis.*

4 (3). Frontal area indistinct; 3rd cubital cellule scarcely dilated at the apex; stigma testaceous.

5 (6). Antennæ as long as the thorax and abdomen in ♀; as long as the body in ♂; clypeus white .. *breadalbanensis.*

6 (5). Antennæ not longer than abdomen in ♂ and ♀; clypeus black.

7 (8). Labrum white; spurs half the length of metatarsus; wings not much longer than body .. *carinatus.*

8 (7). Labrum black; spurs one-third of length of metatarsus; wings longer than body .. .. *lativentris.*

Nematus breadalbanensis, n. s.

Black; apex of clypeus, labrum, and palpi, white; legs pale testaceous; the coxæ, except at extreme apex, the trochanters in part, the basal two-thirds of anterior femora and posterior femora, almost wholly black; with the apex of the hinder tibiæ and tarsi fuscous. Head roughly punctured, opaque, slightly pilose, scarcely broader than the mesothorax; vertex thick, front projecting; labrum subquadrate; mandibles piceous; thorax black, scarcely shining, covered with a sparse pubescence, minutely punctured; pleuræ punctured, opaque, and covered with a close short pile; the edge of the pronotum and tegulæ are pale testaceous; the cenchri

are of moderate size. Abdomen longer than head and thorax; anal segment testaceous. Antennæ as long as the body, stout, black, the 3rd and 4th joints about equal, the 3rd slightly curved, longer than the longitudinal diameter of the eye. Wings hyaline; nervures testaceous at base, black at apex of wing; costa and stigma testaceous-white. Calcaria one-third of the length of the metatarsus; 2nd tarsal joint longer than 5th.

The female has the antennæ as long as the thorax and abdomen, and they are more slender than in the male; the black on the apex of posterior tibiæ is less (in male it sometimes extends to the base of the tibiæ, while, it may be added, in other specimens it scarcely exists at all); the anal segment is dirty white above. The size of the 3rd cubital cellule varies, it being sometimes as long as broad, while it may be much longer than broad. The 2nd recurrent nervure is in most of the females I have seen joined to the 3rd transverse cubital nervure, or nearly so; but in one or two specimens it is at some distance from it, which is its normal position with most males. The testaceous colour on the pronotum varies in extent, and may be entirely absent.

This species comes near to *N. pallipes*, Fall., and at first sight, when I had only males, I considered it identical with that species. It would seem to differ, *pallipes* being a broader and stouter insect, the posterior tarsi are blacker, the band on the pronotum broader, the apical abdominal segments are dirty testaceous, the coxæ are testaceous, the femora have only a thin black line, and the spurs reach to the middle of the metatarsus.

Not uncommon on the Scotch mountains at an elevation of 3000 feet and upwards. *N. pallipes*, according to Thomson, is found "in forest tracts." I have a German specimen of it.

The two other British species of the group are *N. Whitei*, Cam. (which, by the way, has nothing to do with *N. lativentris*, Thoms., as stated by André, Species des Hymén. i., Cat., p. 15); and *N. brevicornis*, Thoms., Opus. 622, 18; Hymen. Scand. i., 100, 25. The latter species I bred from a green larva marked with orange and black spots, which fed on birch, but unfortunately it spun up before a description of it could be taken.

Nematus carinatus.

Hartig, Blattw., 199, 28.

As the female of this species has not been described, I give a description of it here.

Black, thick. Head as broad as the thorax. Antennæ thick, as long as the abdomen; the 3rd and 4th joints about equal; the apical joints thinner; labrum white; mandibles piceous; palpi dirty white; apex of abdomen, cerci, tegulæ, and a thin line on pronotum close to tegulæ, brownish-testaceous. Wings hyaline; costa and stigma yellowish-white; nervures pale at base of wing, darker at apex. Legs black; apical half of anterior femora, the knees of posterior, and tibiæ and tarsi, brownish-testaceous; apex of hinder tibiæ and the tarsi fuscous-black; the extreme apex of coxæ and the trochanters on under side testaceous. Cerci as long as 2nd joint of posterior tarsi; sheath of saw pilose, projecting. Length, $3\frac{1}{2}$ lines.

This insect is much broader than *breadalbanensis*; the head is much thicker, clypeus black, cenchri larger, while the coloration of the legs is darker, and the clypeus is not so sharply truncated at the apex. The furrow on the middle lobe of the mesonotum is very deep, while there is a raised ridge running down the centre of the scutellum, which is not visible in *breadalbanensis*; in the latter, too, there is a transverse furrow which goes across the apical third, dividing the scutellum, as it were, in two. *Pallipes* again has the antennæ as long as the thorax and abdomen, the pronotum is almost entirely pale, the cerci are shorter, the abdomen "almost cylindrical"; while in *carinatus* it is broad and flat, broader in the middle than the thorax, and ending in a blunt point at the apex, the testaceous colour at the apex, too, being much less.

Thomson (Hymen. Scand. i., 97) quotes *carinatus* doubtfully as a synonym of *pallipes*.

Nematus caledonicus, n. s.

Reddish-yellow; two black longitudinal marks on mesonotum; the dorsum of the abdomen with black transverse marks, interrupted in the middle; metanotum with two short black marks at the sides. Wings yellowish; stigma testaceous, black at the base. Antennæ as long as the abdomen and half of the thorax; the 3rd

joint shorter than the 4th, but longer than the long diameter of the eye; the four basal joints are black above. The 3rd cubital cellule is nearly one-fourth shorter than the 2nd; the recurrent nervure is received close to the 2nd transverse cubital. The spurs reach to near the middle of the metatarsus, and are nearly as long as the cerci. Extreme apex of sheath black. Length, $2\frac{3}{4}$ lines.

Belongs to the *luteus* group. It differs from *N. bilineatus* in its longer and clearer coloured antennæ, less sharply incised clypeus, in the lighter tint of the body coloration, narrower head and abdomen, longer spurs, clearer and more yellowish wings, longer 3rd cubital cellule; by the narrower black bands on mesonotum and on breast, where the black is much narrower, and by the black marks on the abdomen. In the last peculiarity it approaches *N. acuminatus*, Thoms., as it does in body form, but the apex of the abdomen is broader, the body stouter, broader, the mouth and tibiæ are not white, the 2nd and 3rd cubital cellules are longer, the recurrent nervures received nearer the transverse cubital, and the recurrent nervure in hinder wings is not interstitial.

Claddich, Loch Awe, in June.

Nematus collinus, n. s.

Luteous; the head (mouth excepted), antennæ, the breast, metapleura more or less, three longitudinal marks on mesonotum, scutellum, metanotum in centre, apex of posterior tibiæ and tarsi, black; apex of clypeus, labrum, coxæ, trochanters, tibiæ, and greater part of four anterior metatarsi, white. Wings hyaline; costa testaceous at base; apex fuscous; stigma black; 3rd cubital cellule much longer than broad, and much wider at apex than at base; recurrent nervures in hind wings received close to each other. Antennæ shorter than thorax, and abdomen stout, tapering at apex; the 3rd joint shorter than 4th. Clypeus slightly and broadly incised. Spurs more than one-third of the length of metatarsus, and a little longer than the cerci. Sheath of saw black at apex. Length, $3\frac{1}{2}$—$3\frac{3}{4}$ lines.

Similar to *melanocephalus*, but smaller. Antennæ, if anything, longer; the mesonotum not entirely black; 3rd cubital cellule much longer and narrower at base compared to width at apex; spurs a little longer and

sharper at apex; recurrent nervures in hind wings received closer to each other; clypeus almost transverse, &c. It has a superficial resemblance to *ribesii*; but that species is readily separated from it by the pale antennæ. The black marks on lateral lobes of mesonotum are sometimes united to scutellum, which may be entirely black, or its apex may be luteous; and the metanotum may also be black, or only the space surrounding the cenchri. The amount of black colour on the breast and sides also varies.

Rare; on birch in June. Craig Dhu, Kingussie; Claddich, Loch Awe.

Nematus glenelgensis, n. s.

Dark brownish-red; the antennæ, the space surrounding the ocelli, breast, a mark on middle lobe of mesonotum, the greater part of the lateral lobes, apex of scutellum, metanotum, base of abdomen, a broad transverse mark on the four apical segments, cerci and sheath of saw, deep black. Labrum and clypeus dirty white. Legs pallid testaceous; coxæ at base, the basal fourth of anterior femora, basal half of middle and the whole of the posterior pair, lined above and beneath with black; all the tarsi, apex of anterior tibiæ, apical half of middle and the whole of posterior pair, black. Wings hyaline, with a very slight griseous tinge. Costa and stigma fuscous-testaceous, the latter griseous in the middle. Length, 3¼ lines.

I sent a specimen of the above-described species to the late Prof. Zaddach, who returned it as probably a variety of *histrio*, but I believe myself it is a distinct species. It is smaller by a line than the ordinary form of *histrio*; the ground colour is very much darker, the legs especially being almost entirely black; the antennæ are longer, thinner, and taper more towards the apex, and the saw differs, its apical division being bent in the middle, while with *histrio* it is straight.

I bred it from larvæ which I got feeding on *Salix aurita* at Glenelg, Inverness-shire, and these larvæ appear to agree very closely with those of *histrio*, but were smaller and more slender. The head was light green; mouth dark brown. Legs light green; claws brown. Body dark green; the segmental divisions are marked with white lines. Down the back runs a dark green

line, bordered on either side by a narrower white one. On the side runs another white line; all the lines end on the 2nd last segment, which with the last is of a lighter green colour, and bear a broad white mark on the top. The skin is beset with numerous little black points.

Nematus glottianus, n. s.

Dark reddish-luteous; the hinder edge of vertex and a longitudinal line on each of the lateral lobes of the mesonotum black. Antennæ pale testaceous, not much longer than the abdomen; metathorax stout, attenuated at the apex; the 3rd and 4th joints equal; the apical joints are slightly fuscous; mesonotum finely punctured. Wings yellowish hyaline; stigma and costa testaceous; 3rd cubital cellule one-fourth longer than broad. Tarsi nearly as long as the tibiæ, extreme apex of all the joints fuscous; metatarsus not double the length of the 2nd joints; spurs one-third of the length of the metatarsus. Length, 3 lines.

The larvæ feed gregariously on the leaves of *Salix cinerea* in the autumn. The head is a little narrower than the 2nd segment, is intensely black and slightly punctured; the sides of the mouth are greenish. Legs glassy white, slightly tinged with green; claws black; claspers light green. The body is of a beautiful dark sea-green. On the sides are ten large oval orange spots, divided by a fold of the skin in two, but still remaining continuous. Below there is a line of roundish, irregular black dots, and below these again and over each clasper is a longish, oblong, black spot; while there are two rows of small black dots, these, however, forming the commencement of the middle line of black dots. Over the orange marks is a line of close continuous black dots, irregular in shape, but, if anything, oblong, and which proceed from the 2nd to the 12th segment. On the back are, at the termination of each segment, two rather small roundish dots. Directly over the anal segment is a large round black mark, much larger than any of the others. The first orange spot is directly over the 2nd pair of legs. Length about $1\frac{1}{4}$ inch.

The cocoon is of the usual form and colour, is double, and is spun in the earth.

Seemingly a rare species. I have only met with the larvæ once in the autumn near Port Glasgow.

This is the form mentioned (E. M. M. xii., 128) as feeding on willow, and which I then referred to *N. cadderensis*, Cam. The description of the larva given (*l. c.*) refers to *glottianus*; that of *cadderensis* will be described in vol. ii. of Phyto.-Hym., and is figured in vol. i., pl. iv., fig. 10.

Nematus v-flavum, n. s.

Black, shining; labrum white; pronotum, tegulæ, the greater part of mesopleura in front, metapleura in part, the edges of the middle lobe of mesonotum (forming a V-shaped mark), abdomen and legs, orange-yellow; the base of abdomen with two small transverse black marks. Antennæ not much longer than metathorax and abdomen; the 3rd joint the length of 4th; black, dull brown beneath. Clypeus truncated at apex. Spurs scarcely reaching to middle of metatarsus; claws almost bifid. Wings hyaline; costa and stigma testaceous; 3rd cubital cellule nearly one-fourth longer than broad. The anal segment is large and considerably developed above, where it ends in a slope, as in the *luteus* group; the cerci are nearly as long as the spurs. Female. Length, $2\frac{3}{4}$ lines.

Allied to *conjugatus*, but is of a longer and broader body form. The stigma is more uniformly coloured, the 3rd cubital cellule longer and nearly as broad at the base as at the apex, the spurs are shorter, metatarsus longer, and the apex of the tibiæ and tarsi are not black, nor are the tibiæ whitish; the cerci are longer, and the sheath of saw is not so black, nor so hairy; the labrum is longer, and the clypeus entirely black. From *N. subbifidus*, Thoms., it is readily known by its black clypeus, shorter antennæ, testaceous stigma, longer 3rd cubital cellule, testaceous tarsi, and longer spurs. The colour, too, is paler, not being so orange.

In Shuckard's collection.

Nematus pulchellus, n. s.

Black, shining, smooth, covered with a close white pubescence; labrum, clypeus, pronotum broadly, the metapleura, the sides, apex and lower side of abdomen with the legs, pale yellowish-white; a small fuscous spot on the base of coxæ behind. Antennæ nearly as long as the body, filiform, covered with a microscopic pubescence;

the 3rd joint distinctly shorter than 4th. Frontal area distinct, bluntly rounded at the apical angle, almost oval, the apex very slightly indented by the large deep and well-defined antennal fovea. Front sharply projecting; clypeus broadly but not deeply incised. Spurs as long as the cerci. Posterior tarsi and apex of tibiæ infuscated. The blotch is very large. Wings hyaline; costa and stigma yellowish-white; tegulæ of the same colour; 3rd cubital cellule much longer than broad, and nearly double the width of the base at the apex. Claws subbifid. Length, $2\frac{3}{4}$ lines.

The only British species with which it has any resemblance in coloration is *leucogaster*, but that species may be known from it by its shorter, thicker antennæ, punctured head, black metapleura, base of coxæ, and fuscous stigma.

Rare. Clydesdale, on rose.

Nematus maculiger, n. s.

Nematus lacteus, var. b., Thoms., Hymen. Scand. i., 155, 88.

Pale yellowish-white; head darker, more testaceous; a large mark on vertex extending to base of antennæ, a large mark on breast, and the whole of meso-metanotum and back of abdomen (except at junction of segments), black; apex of hinder tibiæ and tarsi blackish. Antennæ short, filiform, black above, brownish beneath; the 3rd and 4th joints subequal. Spurs about one-third of the length of metatarsus, and not much longer than cerci.

The male has thicker, more pilose, and longer antennæ; the mark on vertex is larger, more extended laterally and behind; the mesothorax is entirely black, as well as the whole upper part of the body. The basal half of hind tibiæ and tarsi black; stigma griseous. Length, $2\frac{3}{4}$—$3\frac{1}{2}$ lines.

Very closely allied to *N. lacteus*, Thoms., but somewhat smaller; the antennæ are shorter, with the 3rd joint shorter compared to the 4th, and they are lighter coloured on lower side; the black mark on vertex is wider at the sides, and continued on either side to the antennæ and in the middle to the antennal fovea; behind it is usually more distinctly narrowed than the middle portion; the breast is black; the spurs shorter; the head, too, is more narrowed behind the eyes.

The males of the two species are not readily separated, but *maculiger* has the antennæ more rufescent, the 3rd joint longer compared to the 4th, the mark on vertex is larger, the front is not so sharply pointed between the antennæ (this refers also to the female). In both sexes the amount of black on posterior tibiæ and tarsi and on the back of abdomen varies.

The larva has been found by Mr. J. E. Fletcher; it is very like that of *lacteus*, and is of similar habits. For figure of the larva of the latter, see Monogr. Phyto.-Hym., vol. i., pl. 6, fig. 8.

Rare and local; Clydesdale, Worcester. *N. lacteus* I have not yet found in Scotland.

Nematus oblongus, n. s.

Black; labrum, tegulæ, and the greater part of upper lobe of pronotum, anal segment above and valves, dirty white; coxæ, except at extreme base, trochanters, anterior tarsi and tibiæ, pale yellow; femora reddish yellow; apex of posterior tibiæ and tarsi black. Antennæ thick, as long as abdomen and metathorax, tapering somewhat towards the apex, the joints not clearly separated at the base, more sharply separated at the apex. Wings hyaline; basal third of costa white, the rest of it and stigma fuscous; 1st transverse cubital nervure pellucid; 3rd cubital cellule a little longer than broad, slightly dilated at the apex. Head thick, not dilated behind the eyes; vertical and frontal sutures obsolete, as is also the pentagonal area; clypeus truncated at apex; head, mesonotum, and upper half of pleura finely punctured. The spurs are not much more than one-third of the length of the metatarsus. Length, scarcely $2\frac{1}{4}$ lines.

Closely allied to *N. appendiculatus*, but is smaller, broader, the antennæ are thicker and shorter, vertex thicker, and with the sutures obsolete or nearly so. It comes very near to *aquilinæ*, Voll., but that species would appear to have the pronotum entirely black, as well as the apex of abdomen, and the 1st transverse cubital nervure is quite absent.

England.

Nematus Thomsoni, n. s.

Nematus hyperboreus, Cameron, Fauna of Scot., Hym., i., 32, *non* Thomson.

Black; labrum, anal segments, tegulæ, edge of pronotum, legs, costa and stigma, white; anterior femora largely, posterior nearly all, black. Antennæ a little longer than half the length of the body, setaceous, decreasing in thickness towards the apex; the 3rd and 4th joints equal, the rest shorter. Head a little narrower than the thorax, slightly rounded inwardly behind, black, shining, covered with a longish pubescence; labrum dull white; palpi dark fuscous; front and vertex slightly rugose; sutures and foveæ not deep; pentagonal area obsolete. Thorax shining, smooth, covered with a longish scattered greyish pubescence; the posterior edge of the pronotum and tegulæ are white; cenchri large, white. Abdomen oblong, broad, truncated at the apex, black, smooth, shining, very minutely punctured; anal segment sordid white; cerci long, white, the apices pointing towards each other; saw black, hairy, shortly exserted. Legs dirty white; the coxæ at the base, about a third of the anterior femora, posterior almost entirely, anterior tarsi at apex, the posterior entirely, and the apex of the hinder tibiæ, black; the spurs are short. Wings hyaline; costa and stigma white; nervures blackish; the 3rd cubital cellule is double the width of the base at the apex. Length, $3\frac{3}{4}$ lines.

Differs from *N. hyperboreus*, Thoms. = *clibrichellus*, Cam., male, in the thorax being less strongly punctured, in the tegulæ and edge of pronotum being white, in being somewhat smaller and broader compared to the length, in the posterior tarsi not being black, &c.

I have ventured to name this species after the distinguished Swedish Entomologist, whose works have been of such signal service to British Entomologists.

Taken at Braemar by Dr. Sharp.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY OF LONDON

For the Year 1882.

February 1, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

The President made some remarks in acknowledgment of his re-election, and appointed Messrs. Pascoe, Godman, and Lord Walsingham as Vice-Presidents for the ensuing year.

Election of Member.

Mr. Richard Todd (5, Princes Terrace, Bayswater, W.) was balloted for and elected an Ordinary Member of the Society.

Exhibitions, &c.

Mr. E. A. Fitch exhibited a remarkable variety of *Strenia clathrata*, L., captured at light at Fordingbridge, Hants, by Mr. Stansfield R. Rake, seven or eight years ago. The specimen was unicolorous purplish brown on the upper side, with four small white spots near the costal margin of each fore wing, and with five small white spots on each hind wing; the under side was similar. Mr. Fitch referred to Proc. Ent. Soc. Lond. 1875, p. ii., and Entom. x. 241, for notices of similar varieties.

The Secretary also exhibited, on behalf of Lieut.-Col. R. O'Hara, two larvæ of *Anthocoridæ*, captured on flowers in Galway, and an anomalous Coleopteron which lived in the nests of the common black ant of Bengal [probably *Formica compressa*, Fabr.], but not as a captive; this Mr. Waterhouse considered to belong to a new genus of *Colydiidæ* allied to *Cossyphodes*.

Mr. C. O. Waterhouse exhibited a specimen of *Macromela Sealyi*, Crotch, one of the finest known Languriids, captured near Calcutta by Mr. G. A. J. Rothney; also four specimens of one of the *Pentatomidæ*, which Mr Rothney said swarmed in great numbers on one certain tree, but under different forms; the yellowish red form covering the tree when in blossom; while in about a week's time, after the fall of the bloom, the dark red form usurped its place. The two forms exhibited were apparently distinct species.

Sir Sidney S. Saunders exhibited specimens of *Halticella osmicida*, S. Saund., and read some notes on *Euchalcis vetusta*, Dufour, referring to M. Edmond André's remarks on that species in the last published part of the 'Annales de la Société Entomologique de France' (ser. 6, vol. i. p. 340).

Mr. H. T. Stainton remarked that here the confusion was between black and red; in an instance more especially connected with his own particular line of study it appeared to be between black and white. Haworth, in the description of his *Tinea decorella* (Trans. Ent. Soc. Lond. for 1812, p. 338), had clearly intended "nigris" for one of the words printed "niveis," but it was doubtful which. Were the fore wings of the moth black with a white spot, or white with a black spot?

Papers read.

Mr. A. G. Butler communicated a paper "On a small Collection of Lepidoptera from the Hawaiian Islands." The collection, sent by the Rev. T. Blackburn, consisted of two butterflies (*P. bœticus*) and twenty-three moths, referable to nineteen species, all of which the captor considered rarities. There were four specimens belonging to three species of a new genus (*Mestolobes*) of *Botididæ*, whose structure and ornamentation was very remarkable; the anterior wings had a curious Notodont tuft on the inner margin, and there was a broad band of hairs between the wings at the base, and curious pencils of hair and fan-like tufts on the legs.

Prof. Westwood communicated "Descriptions of the Insects infesting the Seeds of *Ficus Sycomorus* and *Carica*." *Sycophaga crassipes*, Westw., and *Blastophaga Psenes*, L. (*grossorum*, Grav.) were specially referred to, the descriptions being illustrated with numerous drawings.

Mr. D. Sharp communicated a paper "On the Classification of the *Adephaga* or carnivorous series of Coleoptera," being some remarks on Dr. Horn's arrangement of the *Carabidæ*. Messrs. M'Lachlan, Gorham, Waterhouse, and Pascoe made some remarks thereon.

New Parts of 'Transactions.'

Parts IV. and V. of the 'Transactions' for 1881 were on the table.

March 1, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

The Rev. W. Deans Cowan, from Madagascar, was present as a visitor.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, &c.

The Secretary read a communication from the Colonial Office conveying Lord Kimberley's thanks to the Society for the report of the Committee upon the locust-egg feeding larvæ, which report had been transmitted to the High Commissioner of Cyprus.

Mr. T. R. Billups exhibited several queens of *Vespa germanica*, L., three of which were taken on the wing on January 20th last at Wimbledon Common, flying around a felled oak, and thirty-eight others were found together under the loose bark of the tree. The earliest date of capture of a female wasp mentioned by Smith was that of *V. vulgaris* on February 13th, 1859 (Brit. Foss. Hym., &c., p. 216).

Mr. R. M'Lachlan said it would be interesting to know whether such a congregation of wasps found together all belonged to one species.

In reply Mr. Billups stated that he had set twelve of the specimens found on this occasion, all of which were undoubtedly females of *V. germanica*.

Mr. Billups also exhibited nine specimens of *Callistus lunatus*, Fabr., captured at Mount Hill, Reigate, on February 12th, 1882, when the species was found in some abundance. Also sixteen females of *Ichneumon erythræus*, Gr.,* captured at Headley Lane, Mickleham, on February 22nd of this year. The Ichneumons were only found in the tufts of grass growing on the hillocks formed by *Formica flava*.

Mr. E. A. Fitch remarked that it was no uncommon thing to find crowds of the females of certain species of *Ichneumon* hybernating together under the bark of trees, and suggested that this species was hybernating in the tufts of grass, and had selected the ant-hills as a warm and dry site.

Mr. R. M'Lachlan called attention to some papers in which Mr. P. H. Gosse had received some butterflies from Celebes; on each paper there was a very perfect impress of the insect (*Ornithoptera Haliphron*, Boisd., &c.).

The Secretary exhibited the eggs of an Entozoon (*? Sclerostoma syngamus*, Dies), on behalf of Mr. Charles Black, of Langford Bridge, Crumlin, Antrim; the specimens were in spirit, some rounded and others flattened, and were said to be "the eggs of red worm expelled from worm and afterwards from bird."

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* Since identified as *Ichneumon sanguinator*, Rossi. (See Entom. xv. 139, and 'Transactions,' 1882, p. 142).

Mr. R. Meldola read an extract from a paper by Mr. W. H. Edwards, "On certain habits of *Heliconia charitonia*, L." (*Papilio*, Dec. 1881), in which were detailed the sexual attraction possessed by the female pupæ in this species. From the observations of Dr. William Wittfeld, of Georgiana, Florida, it was stated that in some instances connection was effected before complete emergence, and frequently before the wings were fully developed.

The Rev. W. Deans Cowan remarked that this was a very common habit with *Papilio Demoleus*, L., in Madagascar, the males being very commonly found attached to the female chrysalids on the sweet lemon trees (*Citrus*).

Papers read, &c.

Mr. C. O. Waterhouse read the following note:—

"At the last meeting of this Society the Secretary exhibited, on behalf of Lieut.-Col. R. O'Hara, of Galway, a microscopic slide containing a somewhat remarkable beetle. It was stated on my authority to be a new genus of *Colydiidæ* allied to *Cossyphodes*. I have now drawn up a note on this insect, and Mr. Wilson has made a drawing of it for a woodcut.

I hope by these means that the insect may be recognised when it is again met with. In looking at the woodcut it must be borne in mind that the object is transparent, and the upper and lower surfaces are not easily distinguishable. I propose to call it *Paramellon sociale*.

"The general characters are those of *Cossyphodes*, Westw. (Trans. Ent. Soc. Lond., 1850, p. 168). The antennæ are, however, 10-jointed, and the club consists of a single large joint only. When retracted they are completely hidden in a cavity, as in *Cossyphodes*. The apical joint of the maxillary palpi is rather large, obliquely truncate at the apex. On each

side of the head there is a narrow elongate space, at the back of which is a minute transparent spot; this is what appears to be the eye, and corresponds very nearly with that seen in *Cossyphodes*. The anterior and intermediate tarsi are five-jointed; the posterior four.

"The parts of the mouth are not discernible, except the apical joint of the maxillary palpi. There are some strongly marked lines which appear to belong to the elytra, and would correspond with the costæ in *Cossyphodes*, but they are oblique, which makes me feel doubtful on this point.

"The general form of the insect is oval. It is evidently extremely delicately and very closely punctured.

"The following is the explanation of the woodcut:—*a*, antenna magnified; *b*, front leg; *c*, hind leg; *d*, elongate space or impression (apparently bounded on the inner margin by a ridge), with small transparent spot indicating the eye; *e*, apical joint of maxillary palpus.

"The specimen is stated to have been found in the nest of an ant at Bombay."

Sir Sidney S. Saunders read some notes on the terminal segments of the abdomen in the genus *Halticella* and its allies, and on the subdivisions of the genus *Chalcis* of Fabricius.

Mr. D. Sharp communicated a paper "On some New Zealand Coleoptera," which contained some critical remarks on Capt. T. Broun's recently published 'Manual of the New Zealand Coleoptera;' also the descriptions of twenty-five new species, amongst which the more remarkable were a species of *Rhinomacerides* and of *Colydiidæ*, and two of true *Chrysomelidæ*. Seven new genera were also characterised.

Mr. A. G. Butler communicated some "Additional Notes on *Bombyces* collected in Chili by Mr. Edmonds," containing descriptions and notices of several larvæ; also the descriptions of two new genera and species of *Notodontidæ*.

Mr. E. Saunders read a paper "On the terminal ventral segments of the abdomen in *Prosopis* and other *Anthophila*." The abdomen of an aculeate hymenopterous insect was considered to consist of nine segments, and the structure of the seventh and eighth ventral plates in the males of various genera were referred to; figures of these in the species of *Prosopis* were exhibited.

April 5, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of a Member.

Mr. Lionel de Nicéville (Calcutta) was balloted for and elected a Foreign Member of the Society.

Exhibitions, &c.

Mr. T. R. Billups exhibited a number of specimens of the smaller Hymenoptera mounted on discs of microscopic glass, thus enabling their under sides to be readily examined.

The Rev. H. S. Gorham exhibited a remarkable variety of a *Coccinella*, marked with four ocellated spots only, received from Mr. A. E. Hodgson, of Coleford, Gloucestershire; although intermediate between *C. oblongo-guttata*, L., and *C. ocellata*, L., Mr. Gorham did not believe it to be a hybrid. Several members remarked on the really small amount of variation to be found in this group, although commonly believed to be variable.

Mr. Waterhouse said only two British species could be said to vary to any appreciable extent, viz., *C. variabilis*, L., and *C. bipunctata*, L. There were several remarkable varieties of *C. septempunctata*, L., in Stephens' Collection, but he (Mr. Waterhouse) had never yet met with one. In Europe it does not vary, but in India specimens are not uncommonly found in which the spots coalesce.

Mr. Pascoe remarked, however, that he knew of no family of Coleoptera in which there were so many synonyms.

Mr. R. M'Lachlan exhibited his collection of British Trichoptera, contained in five cabinet drawers, and made some remarks on the more interesting forms. He said this collection represented over twenty years' continuous work, and apropos of the President's remarks in his last Address, he might state that the locality of capture for each specimen was very readily ascertained. His only regret was that the specimens had not been pinned with long pins instead of the short ones in general use.

Papers read.

Mr. A. G. Butler communicated a continuation of his "Heterocerous Lepidoptera collected in Chili by Thomas Edmonds, Esq." Forty-five *Noctuæ* were noticed in the present paper, twenty of which are described as new to Science.

New Part of 'Transactions.'

Part I. of the 'Transactions' for 1882 was on the table.

May 3, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

The President made some appropriate remarks upon the great loss Science had sustained by the death of Mr. Charles Darwin; and especially referred to his early interest in Entomology by becoming an Original Member of this Society, founded in May 1833, while he was travelling in South America.

Election of Members.

Dr. Evald Bergroth (11, Robertsgatan, Helsingfors, Finland) and Mr. W. J. Williams (Zoological Society, Hanover Square, W.) were balloted for and elected Members of the Society.

Exhibitions, &c.

The Secretary read a communication from the Secretary of the Essex Field Club, requesting that Members would join in a memorial to the Conservators of Epping Forest and others, requiring that the Forest should be preserved in its *natural condition*, in accordance with the Act of Parliament.

Messrs. M'Lachlan, Meldola, Cole, Fitch, and others expressed the wish of all naturalists that Epping Forest should be retained in its present wild state rather than be converted into a park.

Mr. W. C. Boyd exhibited a dark variety of *Fidonia piniaria*, L., taken at Woking in 1880 by Mr. Mugford; it was a female, resembling, but even darker than, a Scotch specimen. Also a curious pale variety of *Anchocelis pistacina*, Fabr., captured at Cheshunt last autumn.

Mr. T. R. Billups exhibited a series of *Cryptus migrator*, Fabr. These were bred from a cocoon of *Trichiosoma betuleti*, Klug; four specimens emerged on April 6th, and no others until upon the cocoon being cut open on April 20th thirteen specimens flew out; of the seventeen specimens bred only two were females.

Mr. W. F. Kirby read the following:—

Notes on a Hybrid between Antheræa Pernyi, *Guér., and* A. Roylei, *Moore.*

"M. Wailly, the well-known rearer of silkworm moths, has succeeded in obtaining hybrids between *Antheræa Pernyi* and *A. Roylei*, and has requested me to describe one of the moths. *A. Pernyi* is the well-known oak-feeding silkworm of North China, and *A. Roylei* is a North Indian species, also an oak-feeder. Hence they are not species occurring in the

same locality in a state of nature. M. Wailly states, in a paper lately published in the 'Journal of the Society of Arts,' that the male *Pernyi* paired readily with the female *Roylei*, and that the hybrid larvæ (which he describes) proved much more easy to rear than those of *A. Roylei*, with which he had but little success.

"All the hybrids hitherto obtained were females, and therefore, although they laid some large brown eggs, of a slightly oval shape, somewhat flattened, and with a depression on the upper surface, these were of course unfertilized, and no experiment could be made as to whether the race would perpetuate itself. [M. Wailly has since obtained males.]

"The hybrid before me expands just six inches across the wings, which is about the size of large female examples of the two parent species. It is of a greenish-buff colour, nearly as in the female of *Roylei*, but much clearer, and with a distinct tawny shade, especially within the common band; the body and base of the wings are also suffused with a distinct vinous shade more resembling *Pernyi* than *Roylei;* the shape of the wings also agrees better with *A. Pernyi*. On the other hand, the eyes resemble those of *Roylei*, but are considerably larger, the pupil especially being as large as in *Pernyi*, but the projection of the black outer rim, so conspicuous in *Pernyi*, is scarcely indicated. The other markings of the wings are well defined, and resemble those of *A. Roylei*. On the under surface the insect agrees in colour and markings with typical *Roylei*, but the basal band is less distinct and perhaps less waved, and the submarginal black spots, dusted with white and pink, are larger and more distinct. Just inside these is a very faint dark stripe, more distinct on the right wing. In *Roylei* this is still more indistinct, whereas in *Pernyi* it is well marked, but closer to the spots. The antennæ and body of the hybrid are more like *A. Pernyi* than *A. Roylei*. The cocoon is fully as large as that of *Roylei*, but instead of there being a considerable space between the outer and inner cocoon there is scarcely any interval between them. *A. Pernyi* has a similar but much smaller cocoon; and hence it would appear that that of the hybrid would be of greater commercial value than either."

The specimen with its cocoon, also cocoons and imagos of the two parent species, were exhibited.

Miss E. A. Ormerod exhibited a curious abnormal growth of the flowers of the common ash (*Fraxinus*) from Osterley Park.

Mr. Fitch said this gall was the work of *Phytopti*, and referred to Dr. Franz Löw's description and figure (Verh. z.-b. Ges. Wien. xxviii. 134, pl. ii. fig. 2).

Mr. Fitch also wished to draw the attention of the members to an unknown woody, irregularly spherical, gall on the ash-keys, of which he once received two specimens from the late Mr. F. Smith; one which he opened contained a fat, white, apparently curculionideous, larva.

Papers read, &c.

Mr. J. B. Bridgman communicated some "Further Additions to Mr. Marshall's Catalogue of British *Ichneumonidæ*." Sixty-seven species were added to the British fauna, ten of which were new to Science.

Mr. E. Saunders read a continuation of his "Synopsis of British Hymenoptera." The *Diploptera* and *Anthophila* to the end of the *Andrenidæ* were now treated of. Since Smith's 1871 catalogue three *Diploptera* had been added to our list, and eleven *Anthophila;* while, on the other hand, twenty-three species of *Anthophila* included by Smith were rejected for various reasons stated.

Prof. J. O. Westwood communicated a memoir "On the supposed abnormal habits of certain species of *Eurytomides*, a group of the hymenopterous family *Chalcididæ*." A general *resumé* of the life-history notices of the *Eurytomidæ* was given; and Prof. Westwood inclined to the belief expressed by Harris, Fitch, and Walsh in America that certain species were phytophagous; thus having phytophagous and sarcophagous species included in one family, or even genus. Two new species, *Isosoma orchidearum*, bred from *Cattleyia* buds, and *Eurytoma Taprobanica*, bred from the galls on *Ficus Tjiela* of Ceylon, were described and figured.

Mr. E. A. Fitch could not concur in the belief that any of the *Eurytomidæ* were of phytophagous habits, since he had bred many hundreds of specimens belonging to various species from twenty-seven distinct hymenopterous and dipterous galls, in all of which they were undoubtedly parasitic. He especially referred to Dr. Giraud's and Dr. Mayr's papers in the Vienna 'Verhandlungen' (vol. xiii. pp. 1250–1296, and vol. xxviii. pp. 297–334). The evidence of phytophagism seemed to rest on the "joint-worm" (*Eurytoma hordei*, Harris) of America, and on *Isosoma hyalipennis*, Walk., or *I. longipennis*, Walk., a species bred from galls on *Triticum* in this country. He had bred some scores of this latter insect, but believed it to be parasitic on a dipterous gall-maker, either an *Ochthiphila*, as stated by Giraud, or a *Lonchæa*, as stated by Perris. On comparing these twitch-galls with the reed-galls produced by *Lipara lucens*, Meig. (specimens of both being exhibited), from their analogous structure it seemed fair to conclude that our *Triticum* gall was produced by one of the *Muscidæ*. *E. hordei* is also more probably a parasite of some Muscid allied to *Chlorops;* in both cases the parasite being far more frequently bred than its host. Mr. Fitch exhibited numerous specimens of the galls of *Lipara similis*, Schiner, of *L. lucens*, Meig., and of *L. tomentosa*, Macq., on *Phragmites*, received from Dr. G. L. Mayr; also a quantity of the galls on *Triticum* collected at Maldon, Essex, and similar galls on *Ammophila arundinacea* collected at Saltburn, N. Yorks., and near Conway and Llandudno, N. Wales, by Mr. P. Inchbald;

series of *Eurytoma hyalipennis*, Walk. (? = *I. graminicola*, Gir.), *E. longipennis*, Walk., and specimens of three species of *Braconidæ*, two species of *Pteromalidæ*, and two other Chalcids bred from the *Triticum* galls.

June 7, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, &c.

Mr. P. B. Mason exhibited a specimen of *Zygæna filipendulæ*, var. *chrysanthemi*, Esp., figured by Hübner, which was captured by Mr. J. E. Nowers last June in Bewdley Forest; also a corresponding greenish black variety of *Callimorpha dominula*, L., bred at Dover. Mr. Mason remarked that he had recently examined the specimens of *Xylophasia Zollikoferi*, Fr., now in the Doubleday Collection at the Bethnal Green Museum, which was captured by Mr Harding at Deal about ten years ago, and he had no doubt but that it was a bleached specimen of the dark variety of *X. polyodon*, L.

Mr. Mason also exhibited two specimens of the *Noctua* recorded by Dr. Knaggs as *Agrotis helvetina*, Boisd. Three specimens were taken near Derby in 1870; one of these Mr. Mason received direct from the captor, and the other but one remove from him. He had recently sent these to Dr. Staudinger for his opinion, who returned them as "perfectly unknown to him, but doubtless a great aberration of some *Noctua*, most probably *N. augur*." This agreed with what Mr. Mason had previously surmised. He also remarked that he had the exact locality of capture well searched again, but without any success. A specimen of the true *A. helvetina* from Staudinger's collection was exhibited for comparison; it differed widely from the British examples.

Mr. H. T. Stainton said that he thought the specimens more resembled *N. xanthographa* than *N. augur*.

Mr. J. Sang said this was so, but upon a closer comparison these specimens were seen to be more glossy and the costa was straighter than in *N. xanthographa;* he could faintly trace the markings of *N. augur* in a strong light, and concurred in the opinion that it was a remarkable variety of that species.

Mr. Stainton called attention to the fact that apparently all the larvæ of *Nematus ribesii* had died in their infancy this spring; the leaves of the currant-bushes had been riddled by the young larvæ, but he had not yet seen a single leaf stripped.

Papers read.

Mr. R. M'Lachlan read "A revised list of British *Trichoptera*, brought down to date, and compiled with especial regard to the 'Catalogue of British Neuroptera' published by the Society in 1870." That catalogue included 136 species; 152 were now enumerated. Twenty additions had been made to our Fauna in the twelve years; three of the old names were now treated as synonyms, and the evidence of the British origin of *Philopotamus montanus* was now considered insufficient.

Mr. W. L. Distant read "Descriptions of new species and a new genus of *Cicadidæ* from Madagascar." He remarked that the distinct character of the Rhynchotal fauna of Madagascar was specially marked by the fact that every species of the widely distributed genus *Platypleura* received from that island was new to Science.

Mr. A. G. Butler communicated a continuation of the "Heterocerous Lepidoptera collected in Chili by Thomas Edmonds, Esq. Part III. Geometrites." In this paper 136 species of *Geometræ* are included, a large proportion of which are new to Science. Mr. Butler remarked on the vague descriptions given by Blanchard in Gay's 'Fauna Chilena,' and on the inaccurate illustrations in the 'Atlas.' Mr. M'Lachlan said most of Blanchard's types were preserved in the Museum at the Jardin des Plantes, Paris.

July 5, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of a Foreign Member.

Senor Carlos Berg (Museo Publico, Buenos Ayres) was balloted for and elected a Foreign Member of the Society.

Exhibitions, &c.

Sir Sidney S. Saunders exhibited winged specimens of *Cerataphis lataniæ*, Boisd., received from M. Jules Lichtenstein, of Montpellier, who referred to it as "a very rare form of a common Aphidian of hothouses." This Aphis was described by Boisduval as a *Coccus*, and by Signoret as an *Aleurodes*.

Sir Sidney Saunders also read the following note contributed by M. Lichtenstein:—

"My observations upon plant- and bark-lice lead me to think that the male sex is but a stage of degradation in animals; the original type of all

living beings is an hermaphrodite cell, of which the centre is female and the peripherous part male. If the cell keeps united the animal remains an hermaphrodite or parthenogenetic creature; if, by some yet unknown process, the peripherous part, which is entirely formed of spermatozoid buddings, is separated from the central ovum, the two sexes appear. This question cannot, of course, be fully treated of in one page of a letter; yet I should like to submit the idea to my colleagues of the London Society, where there are so many eminent observers of insect-life."

Miss E. A. Ormerod exhibited a specimen of *Sitones puncticollis*, Steph., bred at the end of last May from larvæ found feeding commonly on the rootlets of red clover near Chelmsford, Essex, by Mr. Christy; also at Rothamstead by Sir J. B. Lawes. It had previously been conjectured that the "white maggot," which is so commonly destructive to the red-clover plant in early spring was the larva of *Sitones*, but hitherto the imagos had not been bred.

Mr. Fitch said he could testify to the destructive habits of this pest in Essex, and he believed it was the chief cause of so-called "clover sickness" in many localities; where he had pointed out the habits of this larva to agriculturists this was found in almost every instance to be the cause of the plant dying off, and "white maggot in the young clover" was quite a well-known farm-pest in Essex. Mr. Fitch had failed to breed the beetles from many hundreds of larvæ collected, and was very pleased to see that Miss Ormerod had been successful.

Miss Ormerod also exhibited several young pine plants of about five or six years' growth, which had been barked by the larvæ of one of the Lamellicornes, most probably *Melolontha vulgaris*. The plants were received from Mr. Taylor, agent to the Earl of Shaftesbury, from near Salisbury, where several thousand acres of plantation had been destroyed. It was remarked that this was the first instance of such great destruction from chafer larvæ in Britain, although they had proved similarly destructive to *Coniferæ* in Canada.

Mr. E. A. Fitch exhibited the imagos and cocoons of two species of *Polysphincta* (*P. tuberosa*, Gr., and *P. pallipes*, Holmgr.?), also a drawing of the curious larva of *P. tuberosa* made by Mr. G. C. Bignell. The larvæ of these Ichneumons are external parasites of spiders, and although a similar economy had been previously recorded by De Geer, Blackwall, Laboulbène, Vollenhoven, Brischke, &c., and a specimen probably allied to these had been exhibited at a meeting of this Society (Trans. Ent. Soc. Lond. 1868, p. l), very little appeared to be generally known on the subject. Mr. Fitch read details of observations upon the specimens exhibited from the Rev. A. Matthews and Mr. G. C. Bignell.

Mr. Fitch also exhibited an apparently new species of *Belytidæ*, captured by the Rev. A. Matthews on August 19th, 1874, among a colony of *Anom-*

matus 12-*striatus*, Müll., in rotten wood at a depth of three to four feet below the surface of the ground. Mr. Matthews had no doubt but that the *Belyta* was parasitic on *Anommatus*.

Mr. A. S. Olliff remarked that he had recently captured a specimen of *Anommatus* 12-*striatus* in rotten wood at Whetstone, Middlesex.

Mr. C. O. Waterhouse exhibited a peculiar May-fly said to be luminous, captured by Mr. G. Lewis at Kitugalle, Ceylon, 1500 ft. above the level of the sea.

The Rev. A. E. Eaton said the specimen was a male *Teloganodes*, and was the first male imago of the genus he had seen. There were sub-imagos of the genus *Teloganodes* (type *Cloë tristis*, Hag.), both in the British Museum and in Dr. Hagen's collection. Mr. Eaton called attention to the fact that Dr. Hagen had already recorded an instance of luminosity in a male *Cœnis*, as observed by Prof. Zaddach at Neuhausen, near Pillau (Trans. Ent. Soc. Lond. 1873, p. 399).

Mr. G. Lewis remarked of the specimen that when living the whole abdomen was luminous, but not brightly so, sufficiently, however, to serve for its capture on a very dark night.

Papers read.

Lord Walsingham communicated a memoir on "North American *Coleophoræ*." It was almost entirely descriptive of new species of the genus collected by the author in California and Oregon. The occurrence near Washington of two European species new to the United States, viz., *C. cæspititiella*, Zell., and *C. currucipennella*, Zell., was also recorded.

Mr. W. H. Miskin communicated a short paper on "*Ogyris Genoveva*, Hewitson, and its life-history." The larva and pupa were described by Mr. Barnard, of Coomooboolaroo; the former feeds on a species of *Loranthus*, and is nocturnal in its habits.

The Secretary read a paper by Mr. John Scott, entitled "On certain genera and species of the group of *Psyllidæ* in the collection of the British Museum," in which many Walkerian species were redescribed and several new genera characterised; also a second memoir containing the "Descriptions of a new genus and two new species of *Psyllidæ* from South America," which had been received from Dr. C. Berg, of Buenos Ayres, with specimens of the galls which they produced.

New Part of 'Transactions.'

Part II. of the 'Transactions' for 1882 was on the table.

August 2, 1882.

F. D. Godman, Esq., M.A., F.R.S., &c., Vice-President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Member.

Mr. Hildebrand Ramsden (26, Upper Bedford Place, Russell Square, W.C.) was balloted for and elected a Member of the Society.

Exhibitions, &c.

Mr. F. Enock exhibited three males and three females of *Macropis labiata*, Fabr., which he had captured within the last few days on the banks of the Basingstoke Canal at Woking Station, Surrey. He captured all the specimens whilst standing still, off the flowers of *Lysimachia vulgaris*, and especially noticed that the bees arrived from one direction, flying very rapidly. Mr. Enock said the flight of *Macropis* was much like that of the male *Eucera;* next year he hoped to discover the home of the species in his locality.

Mr. T. R. Billups exhibited a pair of *Paragus tibialis*, Fallen, which he found last June in the burrows of *Halictus nitidiusculus;* also a specimen of *Discomyza incurva*, Fallen, captured at Box Hill; this Muscid was unrecorded as British.

Mr. F. P. Pascoe said he captured a specimen of the *Discomyza* at Folkestone in 1878.

Mr. A. S. Olliff exhibited seven specimens of *Anommatus 12-striatus*, Müll., captured at Tonbridge last month by Mr. A. C. Horner. They were found in Mr. Horner's garden on two linen-posts, which he had pulled up, from four to six inches below the surface of the ground, where the soil was moist and the stumps rather rotten; the specimens were captured almost or quite on the surface of the wood. Another specimen was captured in a strawberry growing about eight feet from a post. The two posts previously mentioned stood about fifteen feet apart.

Miss E. A. Ormerod exhibited bred specimens of *Sitones lineatus*, L., and read the following:—

Observations on the Development of Sitones lineatus.

"At our July meeting I mentioned that the locality of larval life and transformations of *Sitones puncticollis* had recently been observed; now I have the pleasure of being able to say that during the last month notes have been forwarded to me regarding the feeding-place in the larval stage

and subsequent development of *Sitones lineatus*. These have been taken by Mr. Thos. H. Hart, of Park Farm, Kingsnorth, Kent, who is well accustomed to insect observations, and who first noticed the curculionideous larvæ feeding amongst the roots of his peas on the 31st May. These he sent information of to myself at the time, and during the course of his observations, which he carried on carefully until the 4th July, when the first of the *Sitones* developed, which he identified as *S. lineatus*. I now give a part of the observations which, at my request, he wrote out in detail.

"Mr. Hart mentions the severe injury suffered at one time by his peas, at another by his bean crop, from *Sitones*, together with his wish from the commencement of his studies as an entomologist to make out the much-wished-for point of the feeding-place of the larva. All his examinations, however, were useless until, on his attention being drawn to the clover-root feeding larvæ, he again examined the pea-roots, and instead (as in previous examinations) of drawing up the plant, he dug them up bodily, and carefully removed the earth, and thus secured the curculionideous larvæ feeding amongst the roots.

"These larvæ are whitish, plump, much wrinkled, with brown or ochreous head, and powerful projecting jaws; legs none, and the extremity of the anal segment used as a foot. The length, when full grown, is about three-sixteenths of an inch. In this state it appears to do little damage compared to that which is afterwards caused by the fully-developed weevil.

"There were indications of the grubs having eaten channels along the main roots, but the peculiar gall-growth on the fibres appeared to be their favourite food, and the fact that some of the larvæ had ensconced themselves within these galls caused doubts in the mind of the observer as to whether the formation of this gall-growth was due to the weevil, but no larvæ could be found by Mr. Hart in galls which were without a visible entrance.

"When full-fed the larva forms an oval cell, without any lining, about two inches under-ground, and at once undergoes its transformation. The pupa is white, but as it matures the eyes become black and the rostrum pitchy; each segment of the abdomen has a row of short spines, and the anal one a pair of long spines placed one on each side of the extremity.

"The imago is at first creamy white, with the head pitchy and eyes black. Specimens confined in a box attained their normal colouring (which Mr. Hart describes in full) in about forty-eight hours; but at large the weevils do not appear to leave their nidus for some time longer, probably to admit of their integuments becoming fully hardened before exposure.

"The development of the first imago took place on July 4th—that is, about five weeks from the time of the first observation of the larvæ; and to the above notes, which I have given nearly in Mr. Hart's words, he adds a good deal that is of interest practically, regarding the damage caused by the weevils, and some of their habits, through which they may, at least in some

degree, be diminished by means of common methods of cultivation; but as these would possibly not be of interest here I have not entered on the subject.

"I may add, as we have not yet any note on the egg, that in the course of my own experiments, in the hope of making out the life-history of this species of *Sitones*, a few years ago, that I imprisoned a large number of weevils taken from peas early in the year, and that they laid roundish white eggs in considerable numbers indiscriminately on everything, whether the leaves within their cage or the glass or cork; but although there was obviously every reason to expect the eggs to hatch satisfactorily, each one perished. Looking at the fact of the eggs being laid (and perishing in an unnatural locality) just before the time when Mr. Hart's observations show that the larvæ are to be found feeding on the pea-roots a little below the surface of the ground, it seems to me scarcely open to doubt that the weevils go down into the earth to lay, as well as to conceal themselves or for shelter."

Miss Ormerod also exhibited a specimen of a *Cicindela* received in a letter from Mr. Rassam, who had found this and other "flies" very troublesome in the intense heat whilst making his explorations at Babylon.

Mr. W. L. Distant exhibited many specimens of *Xyleborus Saxeseni*, Ratz., a species which had proved very destructive to a quantity of beer sent out to Rangoon, presumably by boring through the casks. The beetles were received from Dr. Biddie, of Madras, who stated that they swarmed in the beer itself.

Papers read.

Mr. George Lewis communicated some notes entitled "On a visit to Ceylon, and the relation of Ceylonese beetles to the vegetation there," giving a general account of the natural features and flora of the country with reference to its coleopterous fauna. Mr. Lewis's visit extended to five months only, but in that time he collected over 10,000 specimens, referable to about 1200 species.

Mr. H. Pryer communicated a short memoir "On certain temperature forms of Japanese butterflies." The spring and summer broods of many species which had been bred were particularly referred to, many hitherto having been considered distinct species. Mr. Pryer considered the changes to be due to the temperature experienced during the larval stage of the species. Eleven, and probably a twelfth, species of *Terias* were considered to be but forms of one species.

An interesting discussion followed the reading of these two papers.

Mr. F. D. Godman expressed the wish that Mr. Pryer would continue to follow up his researches in this direction, which could but lead to very valuable results. Mr. Jonas had already told us that *Papilio xuthus* and *P. xuthulus* were but forms of the same species; now Mr. Pryer had proved

it by breeding both from the larva. Mr. Pryer's remarks on other species, especially *Terias*, were passed in review, and Mr. Godman concluded by calling attention to Mr. W. H. Edwards's beautiful plates representing the winter and summer broods in the genus *Phyciodes*, which is allied to *Melitæa*, in Part VII. of the second series of his 'Butterflies of North America'; he also stated that Mr. Edwards was working at the same subject in other groups.

Mr. R. Meldola said that Mr. Pryer's remarks were of extreme interest to him, but only wished that the author had submitted wings of the different broods of his bred species that they might be figured in illustration of his remarks. Dr. Weismann had already remarked that many species were not seasonably dimorphic in Northern Europe, but were distinctly so further south; this appeared also to hold in Japan. His researches tended to prove that the changes were more or less affected with the duration of the pupal state rather than the larval, and that those species having well-marked dimorphic or temperature broods mostly hybernated as pupæ.

Mr. E. A. Fitch did not think these temperature forms were always constant, but that they varied according to localities and seasons: he especially referred to the very distinct third brood of *Colias Edusa* which was produced in Britain in 1877.

Mr W. L. Distant made some remarks on Mr. Pryer's notes, and expressed the belief that many of our so-called species were but seasonal or dimorphic forms of others, and hoped that those naturalists who had the opportunity of breeding various species would turn their attention to the subject. Wallace had already expressed his opinion that *Papilio Pammon* and *P. Memnon* possessed both dimorphic and trimorphic forms of the female; still this was awaiting actual proof, and he hoped that Mr. W. B. Pryer would do for these species what his brother had done for *P. xuthus* and *P. xuthulus*.

Mr. P. C. Wormald joined in the discussion, and said with reference to Mr. Distant's remarks about his relative Mr. W. B. Pryer, he was now Governor of the Sandakan district of North Borneo, and could give but very little time to his favourite study.

Mr. F. P. Pascoe, after congratulating the Society on the two important papers just read, remarked that some years ago Sir Emerson Tennant published, in his work on Ceylon, a list of the Coleoptera, drawn up principally by Mr. Walker, from which it appeared that rather more than half the genera were European (184 out of 358), thereby shewing that, so far as the Coleopterous fauna was concerned, Ceylon, like India, formed part of a transitional zone between the Palæarctic and Indo-Malayan regions. A list with Mr. Lewis's discoveries and a more modern appreciation of genera will be very valuable.

Mr. C. O. Waterhouse read some "Descriptions of new Coleoptera from Madagascar belonging to the *Melolonthidæ*." Thirteen new species and one new genus (*Eutrichesis*) were characterised.

September 6, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, &c.

Mr. R. M'Lachlan exhibited a box containing 500 or 600 *Neuroptera* and *Trichoptera*, being a portion of his captures during a tour in Switzerland (chiefly in the Canton Valais and vicinity of the St. Gothard) and North Italy (chiefly in the Val Anzasca) in July last. There were many interesting forms, including some that were new. The genus *Rhyacophila* was represented by twelve species, including numerous examples of a large new species from Val Anzasca and Val Cannobina, and a number of *R. Meyeri*, M'Lach. (hitherto known from a single imperfect example), from the same localities. There were also curious new forms of minute *Coniopterygidæ*, amongst others a nearly black species from the Val Levantina, and a spotted or blotched species from the Val d'Anniviers.

Mr. M'Lachlan also exhibited a mass of the so-called "Indusial Limestone" of Auvergne, given to him by Mr. H. W. Jackson, M.R.C.S., F.G.S., who found it above Romagnat, near Clermont Ferrand. This curious formation is well known to be made up of the cemented masses of shell-bearing caddis-worm cases lying together in an irregular manner. He read an extract from Lyell's 'Elements of Geology' (5th ed. pp. 201-2, 1855), in which was detailed an account of the position of these indusial beds, and an explanation of the probable manner in which they were formed. Lyell assigned the formation to the Upper Eocene period, and there appeared to be no doubt it originated before the extinction of the volcanoes of the region, because beds of lava, &c., overlie the indusial beds. In connection with this Mr. M'Lachlan remarked that the caddis-cases must have belonged to insects of the family *Limnophilidæ*, and probably to *Limnophilus* itself, but it so happened that, although fossil *Trichoptera* occurred in abundance in even older formations, the *Limnophilidæ* were absent or nearly so (so far as has been recorded), and yet from their strong wing-nervures they appeared the most suitable for preservation in a fossil state. Looking at this formation from an entomological rather than a geological point of view, Mr. M'Lachlan

would consider it of quite recent construction, and certainly as belonging to the post-tertiary period.

The Rev. H. S. Gorham enquired whether there was any explanation of why one species of caddis-worm should almost invariably use one species of shell in the construction of their cases.

Mr. M'Lachlan replied that he could give no more probable explanation than that the shells used were those of the species of mollusc most abundant in the locality.

Mr. J. J. Weir read the following note:—"On 1st March, 1869, I read before this Society a paper on 'Insects and Insectivorous Birds'; the main object of that communication was to show that brilliantly coloured and hairy caterpillars were not eaten by birds. Mr. A. G. Butler, at the same meeting, read a paper relating experiments of a similar character to mine, which showed that lizards and frogs equally rejected as food these gaily coloured or hairy caterpillars. In 'Chambers's Journal' for this year (p. 519) there is an interesting account of a pet trout; this fish was very tame, and readily took food from the hand. The object I have in drawing the Society's attention to the account of this fish is that—although it is stated that he devoured various kinds of spiders and insects—it is remarked that 'with bright coloured or hairy caterpillars he would have nothing to do.'" Mr. Weir also incidentally remarked that he had recently seen an eel rise to the surface of a stream at Lewes and deliberately pick off a caterpillar from the upper side of a leaf of *Nuphar lutea*.

Miss E. A. Ormerod exhibited specimens of a species of *Lina*, apparently *L. cuprea*, Fabr.; they were received from Mr. G. R. Close, who stated that the hazels and willows between Romsdal and Sundal (West Norway) were ntirely stripped of their leaves by thousands of this insect.

Miss Ormerod also communicated the results of some experiments recently made upon the different effects of various rape-cakes on wireworms. There are two kinds of rape-cake in common use amongst agriculturists in this country, *viz.*, Black-Sea rape-cake, which is made from rape-seed, and Indian rape or Kurrachee cake, which is made from mustard-seed. The wireworms refused to feed on the so-called "Indian" rape-cake until it became somewhat putrescent; they then fed on it for about a fortnight, when they died. Other wireworms entered the common Black-Sea rape-cake at once and throve on it for upwards of a month, and this food did not appear to injuriously affect them.

Mr. T. R. Billups exhibited numerous specimens of *Leptidia brevipennis*, Muls., both set and living examples, remarking that it had occurred by thousands in the Boro' Market during the last two months. They occurred in baskets, most of which were two years old, received from Cherbourg, containing vegetables; many of the baskets in which the *Leptidia* swarmed had been in Mr. Billups's possession for upwards of a twelvemonth.

Mr. C. O. Waterhouse, on behalf of Lord Walsingham, exhibited the horns of an antelope, received from Colonel J. H. Bowker, of D'Urban, Natal, which had been almost completely destroyed by the ravages of the larvæ of *Tinea vastella*, Zell. The prominent pupa-cases were so thickly packed on the surface of the horns as to remind one of a larded capon or a *filet de veau piqué*.

Mr. A. S. Olliff exhibited specimens of *Synchita juglandis*, Fabr., taken at Tonbridge by Mr. A. C. Horner and himself, in August last, under the the bark of two beech-trees.

Paper read.

Sir Sidney S. Saunders read the descriptions of three new genera and species of fig insects, allied to *Blastophaga*, from Calcutta, Australia, and Madagascar. The species were characterized under the names of *Eupristina Masoni*, from the figs of *Ficus indica*, received from Mr. J. Wood-Mason from the Botanical Gardens at Calcutta; *Pleistodontes imperialis*, obtained from *Ficus macrophylla* in New South Wales; and *Kradibia Cowani*, from Madagascar; all three in both sexes.

New Part of 'Transactions.'

Part III. of the 'Transactions' for 1882 was on the table.

October 4, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Election of Members.

Mr. Francis Swanzy (Stanley House, Granville Road, Sevenoaks) and Herr Gustav Weymer (58, Kleeblattstrasse, Elberfeld, Rhenish Prussia) were balloted for and elected Members of the Society.

Exhibitions, &c.

Mr. R. M'Lachlan exhibited nymph-skins of *Hagenius brevistylus*, Selys (a dragonfly belonging to the subfamily *Gomphina*), remarkable for their extraordinarily broad and depressed form, and in this respect presenting a striking contrast with the imago, the body of which is very long and slender. They were from Texas, and formed part of a collection made by the late Jacob Boll. A description and admirable figure is to be found in Cabot's "The immature state of the *Odonata*," subfamily *Gomphina*, p. 9, pl. iii., fig. 4 (1872).

Mr. C. O. Waterhouse said that the beetles exhibited at the August meeting, and stated to be injurious to beer-casks at Rangoon, were not

Xyleborus Saxesenii, Ratz., as had been supposed, but another widely distributed species, which was in the British Museum under the following names:—*Bostrichus ferrugineus*, Fabr., from Central America; *B. testaceus*, Walk. (1859), from Ceylon; and *Tomicus perforans*, Woll. (1857), from Madeira and Rodriguez. As there was some doubt as to the determination of the Fabrician species, Mr. Waterhouse proposed to adopt the name *T. perforans*. Specimens are also in the collection of the British Museum from Celebes, Penang, Rio, Porto Rico, and Dorey.

Prof. Westwood thought that a previous instance of insects attacking beer-casks had been brought before the Society many years ago.

Mr. M'Lachlan believed that *Tomicus* and other bark-feeding Coleoptera only attacked unhealthy trees.

Prof. Westwood agreed with the late M. Audouin that the oviposition of these beetles tended in itself to cause disease in the trees attacked. He considered that when casks were saturated with beer the insects might be attracted thereby.

Rev. H. S. Gorham said that he had never known *Hylesinus* or *Tomicus* to attack living trees.

Mr. C. O. Waterhouse said that they appeared to single out individual trees for their attacks, a single tree among many being sometimes greatly infested, while all the others were exempt.

Papers read.

Prof. Westwood read "Further descriptions of Insects infesting Figs," relating to minute *Chalcididæ*.

Mr. G. C. Lewis read "A Supplementary Note on the specific modifications of Japanese *Carabi*, and some observations on the mechanical action of sun-rays in relation to colour during the evolution of species," in which he argued that the similarity of colour in animals and plants inhabiting the same situations was due rather to their being subjected to similar conditions of light, temperature, &c., than to the principle of protective resemblance.

November 1, 1882.

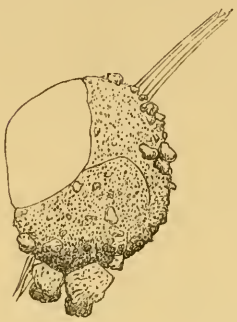
H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

Exhibitions, &c.

Mr. J. Jenner Weir exhibited living specimens of what he believed to be *Conocephalus ensiger*, Harris, which he had received from Messrs. J. Veitch & Sons, of Fulham Road, in whose hot-houses the locust had

appeared in some numbers; they fed readily on flies and spiders, and had thriven in captivity for some weeks. Mr. Weir proposed to place the specimens exhibited in the "Insectarium" of the Zoological Society.



Mr. F. P. Pascoe exhibited a curious spider's nest found on the surface of the ground, attached to a stone, at Cagliari, Sardinia. The nest consisted of a silken bag, covered with earth, with a trap-door; it was quite unknown to the Rev. O. P. Cambridge, and no similar specimens were in the British Museum.

Mr. G. Lewis exhibited specimens of *Syntelia indica*, Westw., *S. histeroides*, Lewis, and *Sphærites* belonging to the *Synteliidæ;* of *Figulus*, *Platycerus* and *Alsalus*, n. s., belonging to the *Lucanidæ;* and of *Sapriuus*, *Hololepta*, and a new genus of *Histeridæ;* remarking on the similarity of outline in the respective genera of the three families, and referred to his recently published note on this subject (Ent. Mo. Mag. xix. 137).

Mr. A. G. Butler communicated a paper entitled "Heterocerous Lepidoptera collected in Chili by Thomas Edmonds, Esq.: Part IV. Pyrales and Micros." The collection contained seventy species of these groups, many of which were described as new. Several of Blanchard's genera were reviewed, and some extended remarks were made on Zeller's genus *Cryptolechia*. A few supplementary species in groups already treated of were referred to, and five additional species described as new.

December 1, 1882.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

Donations to the Library were announced, and thanks voted to the respective donors.

The President announced the names of the Members proposed as Officers and Council for 1883, and nominated the Auditors for the accounts of the current year.

Exhibitions, &c.

Mr. E. A. Fitch exhibited specimens of *Platymetopius undatus*, De Geer, an Homopteron new to the British fauna, captured by Mr. G. C. Bignell near Plymouth, on August 7th last. It had subsequently been taken in some numbers in the same locality by Messrs. Bignell and Scott.

Mr. R. Meldola exhibited a small moth (? a species of *Tinea*) which had been sent to him from Brazil by Dr. Fritz Müller, and which was remarkable

as being ovo-viviparous. Dr. Müller stated that the insect had flown on to his table last September: he then put it under his microscope with the object of studying the neuration, when to his surprise he found it in the act of depositing living larvæ, specimens of which had been forwarded in a tube of alcohol, and were exhibited at the meeting. Mr. Meldola stated that in 1863 a similar habit had been observed in an Australian species, *Tinea vivipara*, Scott, and had been brought under the notice of the Society by Mr. Stainton (Proc. Ent. Soc. Lond. 1863, p. 152).

The Rev. H. S. Gorham exhibited specimens of the rare *Cryptophagus validus*, Krtz. (or possibly *C. fumatus*, Msh.), which he had recently captured in some numbers (three or four specimens each night) on the beer-casks in his cellar. He believed they were imported with the beer from Leatherhead, as he had observed some minute coleopterous larvæ, doubtless those of the *Cryptophagus*, feeding on a minute blue fungus on the casks.

Lord Walsingham exhibited numerous living specimens of *Niptus hololeucus*, Fald., which were found swarming in a plate-closet in Scotland, and were said to be very destructive to the silver contained therein.

Sir Sidney S. Saunders exhibited specimens, many microscopically prepared, of *Kradibia Cowani*, from Madagascar, and made some remarks thereon, especially referring to the middle pair of legs being obsolete in the males (some fifteen or twenty specimens had been examined by Mr. Waterhouse and himself).

Sir Sidney Saunders also communicated the substance of a correspondence with M. Edmond André, of Beaune, respecting, firstly, the synonymy of *Euchalcis vetusta* of Dufour, and *Halticella osmicida*, whereby M. André fully recognises that the former must be considered as a distinct species from the latter, "et que ces deux dénominations s'appliquent à deux espèces différentes, bien qu'il semble étonnant que l'espèce de Dufour n'ait pas encore été retrouvée depuis 1815"; and, secondly, respecting the terminal segments "des Chalcides à queue", stating that his imperfect knowledge of the English language had not enabled him fully to comprehend the comments contained in Sir Sidney Saunders' memoir thereon, which recently appeared in our Transactions (Trans. Ent. Soc. Lond. 1882, p. 291); but that he had revised what he had written upon the subject in the French 'Annales'; had re-perused Dr. Sichel's monograph of 1865; had also compared Prof. Westwood's figure of *Chalcis pyramidea*, Fab., as well as specimens of the respective genera; and that his opinion thereon "est restée toujours la même"; while entering into details with reference to an annotated sketch corresponding with the aforesaid figure (the terminal segments of which had been obviously misinterpreted by him), and requesting that any divergences might be pointed out; adding, "Je ne cherche, comme vous, que l'intérêt de la science, et je suis toujours tout prêt à reconnaître mes erreurs quand elles me sont démontrées."

Having satisfied his enquiries in this respect, M. André subsequently deemed it expedient to sacrifice one of his specimens for the purpose of elucidating the points at issue by full dissections of all its parts, as accurately delineated in the annexed figures accompanying his second letter upon the subject, giving a summary of the results thus obtained.

"Beaune, ce 12 Octobre, 1882.

"Monsieur & bien honoré Collègue,—

"J'ai reçu votre excellente lettre du 27 Septembre et si je n'y ai pas répondu plus tôt, c'est parceque j'ai eu depuis ce temps beaucoup de besogne et que le temps me manquait pour les observations délicates que je voulais faire. J'ai toujours été persuadé que la recherche de la vérité scientifique vous a seule guidée dans les réflexions critiques que vous avez fait connaître sur mon travail, et vous pouvez croire que, loin d'en avoir le moindre ressentiment, je vous suis au contraire très-reconnaissant d'avoir jugé mon travail digne de l'examen approfondi auquel vous l'avez soumis. C'est d'ailleurs, vous le savez, du choc des idées que jaillit la lumière, et, dans les tournois scientifiques, les vaincus aussi bien que les vainqueurs gagnent à voir la vérité dégagée de ses voiles.

"Je ne possède qu'une seule femelle de votre *H. osmicida;* aussi n'ai-je point voulu la sacrifier. J'avais au contraire deux femelles de *Ch. gallica* et je n'ai point hésité à en livrer une au scalpel. J'ai donc disséqué avec le plus grand soin son abdomen, j'ai séparé et préparé pour l'examen microscopique chacun des arceaux dorsaux et ventraux ainsi que toutes les pièces des appareils génitaux. Je suis arrivé à ce résultat avec assez de difficulté en égard à la sécheresse de l'individu que j'ai dû faire ramollir complètement; cependant j'ai obtenu d'une façon bien nette tous mes fragments. De leur examen consciencieusement fait, je suis arrivé à modifier un peu mes premières idées, mais sans pour celà abonder dans les votres et celles du Dr. Sichel.

"J'ai constaté que le fond de la divergence existant entre nos deux opinions résidait en ceci, que vous considérez la partie que j'ai marquée 7 D dans le croquis ci-dessous, comme un arceau ventral correspondant à l'arceau dorsal que j'ai indiqué par 6 D. Or, pour moi, tous deux sont des arceaux dorsaux l'un le 6e, l'autre le 7e. Or il ne faut pas trop s'arrêter à la difficulté de leur trouver des arceaux ventraux correspondants. Bien que les dissections que j'ai opérées fussent faites sur un individu complètement desséché, j'ai aperçu des fragments de téguments, tout à fait internes, mais représentant parfaitement à mon point de vue les 6e et 7e arceaux ventraux. C'est là une des premières raisons qui me fait considérer 7 D comme un arceau dorsal. L'autre raison est que cet arceau porte une paire de stigmates. Bien que vous affirmiez dans votre lettre qu'il faut subordonner les analogies aux faits constatés, je crois que, dans l'état actuel de la question, nous ne

connaissons que trop insuffisamment la structure de cet abdomen (disséqué par moi sur un individu sec et ne pouvant montrer qu'imparfaitement les parties devenues internes) pour déduire de l'ignorance où nous sommes des conséquences en contradiction formelle avec ce qui se passe dans tout le grand ordre des Hyménoptères et même probablement chez tous les insectes, savoir que les stigmates ne sont jamais placés sur la face ventrale. Il est absolument certain que des fragments de téguments ordinairement externes peuvent dans des circonstances données devenir internes, et, en supposant que l'imperfection de ma dissection puisse laisser quelque doute sur les parties devenues internes que j'ai cru découvrir, je suis absolument persuadé que des dissections d'insectes frais montreraient ces arceaux ventraux d'une façon bien évidente. Je ne crois pas qu'il soit permis d'affirmer, sans s'appuyer sur des dissections minutieuses d'individus frais, que le 7e segment n'existe pas. On ne peut le savoir qu'en examinant l'intérieur de l'insecte et je suis convaincu qu'en toutes circonstances on retrouvera toujours le nombre ordinaire des segments, plus ou moins atrophiés ou dénaturés, mais existant au moins à l'état de vestige.

" En résumé je continue à croire :—

" 1o. Que l'hypopygium de Sichel muni d'un stigmate est un arceau dorsal, qui est le 7e.

" 2e. Que son épipygium muni aussi d'un stigmate est le 6e arceau dorsal.

" 3e. Que ces 6e et 7e arceaux dorsaux ont chacun un arceau ventral correspondant, en partie atrophié (faute de place) et devenu interne.

" 4e. Que la partie de la queue qui suit est le fourreau de la tarière et représente le 8e arceau ventral, l'arceau dorsal correspondant étant tout-à-fait interne et représenté par une fraction de l'appareil génital.

" 5e. Que ce fourreau renferme et abrite une gaîne qui contient elle-même deux stylets. Je les ai séparés parfaitement et ai même pu remarquer la forme bizarre en forme de hameçon de l'extrémité de la gaîne, qui est aussi munie d'épines en divers sens.

" 6e. Enfin que la situation étant telle que je viens de le dire et que le représente mon croquis, tout milite en faveur de la réunion des genres *Phasganophora* et *Euchalcis* au genre *Chalcis*, et que si, par suite de la dissection minutieuse à laquelle je me suis livré, ce que j'expose plus haut diffère en quelques points de détail de ce que j'ai dit dans les Annales de la Société Entomologique de France, les grandes lignes de mon argumentation et les conclusions restent les mêmes.

" L'intérêt principal de cette petite discussion réside, à mon point de vue, dans ce fait, que je ne crois pas possible de supprimer d'un trait de plume un segment à l'abdomen d'un hyménoptère ou de doter de la même manière un segment ventral de stigmates. La nature ne bouleverse pas ses plans d'une façon aussi complète ; elle diminue l'importance de certains organes

au profit de quelques autres, mais elle ne les supprime pas ; elle les diminue les atrophie, ou les modifie dans leur forme, mais elle en laisse toujours des vestiges.

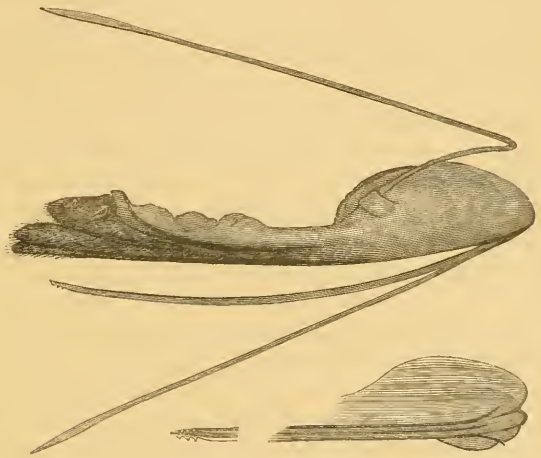
"Je vous serai reconnaissant, Monsieur et très-honoré collègue, de faire part à nos collègues de la Société Entomologiques de Londres de ces quelques observations. L'intérêt de la Science nous pousse tous deux et la Société ne pourra se refuser à admettre une discussion courtoise. Croyez que si je n'ai pas cru devoir céder devant votre opinion, malgré la grande importance scientifique qu'elle prend en sortant de votre plume si autorisée, c'est seulement parceque je suis convaincu d'être dans le vrai ; je reste d'ailleurs tout prêt à renier tout ce que je viens de dire, si la fausseté m'en est absolument démontré par des faits, ce dont je doute jusqu'à présent.

"Veuillez croire, Monsieur et très-honoré collègue, à mes respectueux sentiments.

"Edm. André."

In bringing these details before the Society, as requested by M. André, Sir Sidney Saunders stated that he had pointed out to him a seeming inconsistency arising from the respective parts having been severed from each other without due attention being paid to the connection of the ovipositor with the particular segment referred to in his *first* result. For, as M. André has himself indicated in his excellent work, now in the course of publication ('Spécies des Hyménoptères,' Introd., p. lxxxiii),—"*l'hypopygium* quelquefois laisse voir seulement à sa partie inférieure une fente plus ou moins large où passe chez les femelles les pièces de la tarière ou de l'aiguillon." This is precisely the case in the aforesaid segment—"*l'hypopygium* de Sichel"—which M. André would nevertheless characterise as "*un arceau dorsal*, qui est le 7e." Moreover, as set forth in the same work (p. lxxxvi), the terebra itself and its two demi-sheaths are theoretically

to be regarded in all instances as attached to the *hypopygium*, while the two spiculæ of the terebra are connected with the *epipygium*. Here, however, these five component parts are all associated with the same segment, as clearly defined by a new dissection of *Halticella* exhibited to the meeting, and represented in the annexed woodcut (whereof copy has been sent to M. Andrè), which parts are also shown in their natural position together with this segment, and as withdrawn therefrom, in Sir Sidney Saunders' former dissections; the first represented in figure 3, and the second in figure 11 of Plate XII., 1882.



Hence it would seem that the *lower portion* of this contested segment must inevitably be regarded as the *true hypopygium*, accurately corresponding with M. André's aforesaid description as such; while the *upper portion*, as indicated by a longitudinal lateral line sufficiently apparent, would retain the two spiracles and the basal attachment of the spiculæ to the *dorsal* region, which may possibly be assignable to the *epipygium;* in which case the two tegumentary fragments adverted to by M. André would constitute integral parts of a 6th rudimentary and concealed ventral segment, while the *true epipygium* and *hypopygium* would be connate together in this one terminal segment representing the dorsal and ventral portions of the 7th. Under the peculiar circumstances, however, of this terebral-bearing segment becoming ostensibly pseudo-dorsal at its projecting apex, such abnormal character would scarcely be enhanced by the acquisition of spiracles in conformity with such a transition.

M. Audre's attention has been drawn to this suggested solution, but his reply has not yet been received.*

The Secretary read the following:—

Supplemental Note to a Memoir "On the supposed abnormal habits of certain Species of Eurytomides." (Trans. Ent. Soc. Lond., 1882, p. 307.)

By J. O. Westwood, M.A., F.L.S.

In the thirteenth volume of the 'Verhandlungen' of the Imperial Zoological and Botanical Society of Vienna (1863, pp. 1289–1300), Dr. J. Giraud published an important 'Notice sur les déformations galliformes du *Triticum repens* et sur les Insectes qui les habitent et description de trois espèces nouvelles du genre *Isosoma*, Walk.', in which he described numerous species of insects of various families of Hymenoptera, with particular notices of their habits. Of one of these parasites (*Pimpla graminellæ*, Grav.) he states that its larva, "est tellement fréquente dans les galles de *Triticum repens* que, sans la connaissance de l'insecte qu'elle produit, on serait tenté de la regarder comme le propriétaire légitime. Une circonstance curieuse, et que je n'ai eu occasion d'observer ailleurs que bien rarement, c'est que cette larve parait tirer la plus grande partie de son alimentation de la plante même. C'est là une dérogation aux lois ordinaires qui régissent l'économie des parasites, mais cette exception me parait incontestable et plusieurs espèces, de genres très différents, en fournissent des exemples. Surpris de trouver ces larves constamment seules dans le canal des galles, sans qu'il me fut possible de reconnaître la moindre trace de celles que je devais supposer leur avoir servi de pâture, j'ai repété mes recherches à une époque de l'année où je pouvais espérer de les rencontrer encore dans leur jeunesse. Dès le mois d'août, je les ai vues à divers degrés de développement et souvent n'ayant encore que le tiers ou même le quart de leur taille à l'état adulte; mais, ici encore, il n'y avait aucun vestige de la victime que je cherchais. . . . . Si l'on tient compte de l'absence de toute victime pendant que la larve est encore jeune et continue à se développer, comme de l'agrandissement de la cavité qui la renferme à mesure, que sa croissance augmente, on ne peut se refuser d'admettre que la larve ne soit phytophage, au moins pendant une grande partie de son existence." &c.

* The following has since been received from M. André, dated Paris, 10th Dec., 1882:—"Je suis en ce moment en voyage et votre dernière lettre m'a été retournée ici. Aussi je ne puis vous répondre complètement aujourd'hui et je vous prie d'attendre mon retour à Beaune qui aura lieu à la fin de ce mois. J'ai besoin évidemment d'étudier sur nature ce que vous me dites; cependant je crois que nous avançons l'un et l'autre vers la vérité et que nous finirons par y arriver d'accord. Je reprendrai donc cette question dès mon retour à Beaune et vous rendrai compte de ce que j'aurai trouvé. En attendant, croyez à mes bien dévoués sentiments."

The author then describes a new species of *Isosoma* (*I. graminicola*), of which he says that its larva resembles those of the genus *Eurytoma*, but is of a more elongated form, and adds, "Les détails que j'ai donnés sur la larve de l'espèce précédente conviennent aussi à celle de cette *Isosoma*. Elle grandit et se transforme à la même époque. A quelque âge que je l'aie observée, je n'ai jamais rencontré de victime auprès d'elle, et il m'a paru évident qu'elle tirait aussi sa nourriture de la plante, au moins pendant la plus grande partie de sa croissance. Ce genre de vie contraste avec celui des larves du genre *Eurytoma* habitant dans les galles des *Cynips*, car ces dernières sont constamment zoophages et on les rencontre appliquées sur le corps de leur victime pendant tout le temps qu'elles ont besoin de prendre des aliments."

The author then gives descriptions of two other new species of *Isosoma*, upon the habits of which he had made no observation, adding the further remarks:—"Dans un fragment assez mince de la tige d'une graminée . . . . (*Festuca*, sp. ?), j'ai trouvé, au mois de mars, réunies sur un point du canal, huit larves semblables à celles de l'*Isosoma graminicola*. L'espace, d'un peu moins d'un centimètre de longueur, occupé par elles, n'était terni par aucune souillure, mais la membrane médullaire avait disparu, en cet endroit, tandis que tout le reste était dans un état normal. . . . . Dans ce cas encore, je ne pûs découvrir aucune trace de victime, et il me parut évident que les larves avaient dû tirer leur nourriture de la substance de la plante, comme nous l'avons vu pour l'*Isosoma graminicola;* mais avec cette différence qu'elles avaient vécu en commun, tandis que les autres étaient solitaires. On serait tenté de croire, d'après ces observations, que ces insectes ne sont pas parasites: mais leur place dans le système et leur affinité avec les *Eurytoma* qui le sont évidemment, rendent cette supposition peu vraisemblable. De nouvelles recherches sont nécessaires."

Papers read.

Mr. P. Cameron communicated the "Descriptions of ten new species of *Nematus* from Britain."

Mr. D. Sharp communicated a "Revision of the species included in the genus *Tropisternus*, Solier (*Hydrophilidæ*)." The thirty-three species of *Tropisternus* are arranged in ten groups forming two very distinct sections. Two species are included in the new genus *Pleurhomus*.

Mr. E. Meyrick communicated a memoir "On the Classification of some families of the *Tineina*," having special reference to the genera included in the *Gelechidæ* by Heinemann and in the *Gelechidæ* and *Œcophoridæ* by Stainton.

Messrs. Stainton and M'Lachlan made remarks on the latter paper, Mr. M'Lachlan stating that he was especially pleased to see that Mr. Meyrick had advocated neuration as a primary guide to classification, but he

doubted whether his method of examining the wings without removing the scales would not lead to error; in many *Trichoptera* he found it impossible to see the neuration without taking the short hairs off the wings.

ANNUAL MEETING,

January 17, 1883.

H. T. Stainton, Esq., F.R.S., &c., President, in the chair.

An abstract of the Treasurer's Accounts for 1882 was read by Mr. R. M'Lachlan, one of the Auditors.

The Secretary read the following:—

Report of the Council for 1882.

In accordance with the Bye-Laws, the Council begs to present the following Report:—

During the year 1882 the Society has lost four members by death: Mr. Charles Darwin (an original and life member), Mr. Henry Reeks, Mr. David Greig Rutherford, and the Rev. George Weare Braikenridge. Six members and two subscribers have resigned. Eight new members have been elected; the Society thus now consisting of two members and two subscribers less than last year.

The Society appears to have quite maintained its position during the past year; many objects of interest have been exhibited, and valuable papers have been discussed at the meetings, which the attendance-book shows to have been well supported; the 63 pages of 'Proceedings' for the year form an interesting record. The 'Transactions' extend to 540 pages, illustrated with nineteen plates, of which four are coloured The twenty-three memoirs have been contributed by fourteen authors. In addition to the usual descriptive papers, the Council has great satisfaction in calling special attention to the four papers exclusively relating to British Entomology and to the eight others of special interest to general entomologists.

Our financial position is shown in the following abstract of the Treasurer's accounts:—

Receipts.		Payments.	
Balance in hand	£3	Rent, Office, and Meeting Expenses	£114
Contributions of Members	243	Publications	260
Sale of Publications	80	Library	27
Interest on Consols	9		
Donations	67		
	£402		£401

The thanks of the Society are due to those who have kindly given liberal donations, and to Lord Walsingham for defraying the cost of a coloured plate (Pl. xvii.) illustrating the new North American *Coleophoræ* described by him.

The Library has been increased during the year by the usual serials and by several donations from members; many entomological serials which have not hitherto been received have been obtained by purchase.

Two essays have been received in competition for the prize of £50 offered by Lord Walsingham and others in 1879 for "the best and most complete life-history of *Sclerostoma syngamus*, Diesing, supposed to produce the so-called 'gapes' in poultry, game, and other birds." After reference to Dr. T. Spencer Cobbold, F.R.S., &c., the Council have awarded this prize to Dr. Pierre Mégnin, late President of the Entomological Society of France, Honorary Associate of R.C.V.S.L., &c. The other essay was received from Mr. Charles Black, gamekeeper to Rev. A. H. Pakenham, Langford Lodge, Crumlin, Antrim, Ireland. It was fully illustrated, and accompanied by seventy rough microscopic preparations, and evinced great industry, but its value was much diminished by the want of proper scientific training on the part of the investigator. As a mark of appreciation of Mr. Black's industry and research, a second prize of £10 has been awarded him. Lord Walsingham has kindly undertaken the publication of M. Mégnin's valuable memoir, which will be illustrated with two coloured plates from the author's beautiful drawings. On behalf of the Society, the Council desires to thank Lord Walsingham for his liberality, and Dr. Cobbold for the help given in an exhaustive report on the comparative merits of the essays received.

As many members are aware, extensive alterations have been made in the Society's rooms. Negotiations with the Medical Society were completed in June last by which it was arranged that this Society should occupy the new south room, with use of new meeting-room, &c., at the same rent as that hitherto paid. The Council is glad to inform members that these alterations will shortly be completed, and that the new Library will be a larger and better-lighted room than the one previously occupied. The thanks of the Society are due to Messrs. Grut and Poole for their care and superintendence during the removal of the books, and to the Medical Society for providing temporary accommodation for the cases.

11, *Chandos Street, Cavendish Square, W.*
17*th January*, 1883.

The President appointed Messrs. R. Meldola and J. Jenner Weir scrutineers.

The following Members of Council for 1883 were balloted for and unanimously elected:—J. W. Dunning, E. A. Fitch, F. D. Godman, H. S.

Gorham, F. Grut, W. F. Kirby, R. M'Lachlan, J. W. May, F. P. Pascoe, E. Saunders, J. W. Slater, H. T. Stainton, C. O. Waterhouse.

The following officers were subsequently elected:—*President*, J. W. Dunning, M.A., F.L.S., &c.; *Treasurer*, E. Saunders, F.L.S.; *Librarian*, F. Grut, F.L.S.; *Secretaries*, E. A. Fitch, F.L.S., and W. F. Kirby.

The President then delivered an address, at the conclusion of which Mr. W. L. Distant proposed a cordial vote of thanks to Mr. Stainton for his services as President during the year, and requested that he would allow his address to be printed with the 'Proceedings.' The proposal was seconded by Mr. J. J. Weir, and carried unanimously.

Mr. M'Lachlan proposed a cordial vote of thanks to the Secretaries, Librarian, and Treasurer, which was seconded by the Rev. H. S. Gorham, and carried unanimously.

Messrs. Fitch, Grut and Saunders made some remarks in acknowledgment.

ABSTRACT OF RECEIPTS AND PAYMENTS FOR 1882.

Receipts. 1882	£	s.	d.
To Balance, 1 Jan. 1882	3	10	6
Subscriptions, as per list	168	0	0
Entrance Fees	10	10	0
Arrears	17	9	6
Compositions	47	5	0
Donations	66	19	0
'Transactions'	80	2	8
Consols, interest on £313 4*s.* 8*d.*	9	4	0
	£403	0	8

Payments. 1882	£	s.	d.
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Balance in hand	0	18	9
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ASSETS.

	£	s.	d.
Balance	0	18	9
Subscriptions due, considered good	10	10	0
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Audited and found correct.

Chas. O. Waterhouse.
J. W. Slater.
R. M'Lachlan.
Ferdinand Grut.

January 10*th*, 1883.

THE PRESIDENT'S ADDRESS.

Gentlemen,

The loss of our most illustrious Member, Charles Robert Darwin, which occurred on the 19th of April last, is still fresh in our recollections. Born on the 12th February, 1809, he was educated successively at Shrewsbury, Edinburgh, and Cambridge.

In the case of any one who has achieved greatness, it is always interesting to search in his early career for the first indications of his future celebrity; it becomes, so to speak, an embryological study of the mental development.

Through the kindness of our excellent Secretary, Mr. Fitch, I have been favoured with a few lines written by one of our still living Original Members on the subject of Charles Darwin leaving Cambridge in 1831. This was in a letter addressed by the Rev. Leonard Jenyns (now Rev. Leonard Blomefield) to James Francis Stephens, April 11th, 1831. It was as follows:—

"Swaffham Bulbeck, April 11th.

"My dear Stephens,

". . . . Darwin, I am sorry to say, has taken his degree, so that we are likely to lose him soon at Cambridge altogether, which I shall very much regret, he having assisted me greatly in working out the Cambridgeshire insects, and proved so very diligent a collector; though I have not yet been able to induce him to extend his enquiries beyond the order of Coleoptera. He comes up for one more term this spring, I believe solely for entomological purposes, and I mean that we should do a great deal together during that time. . . . .

"Yours very sincerely,

"L. Jenyns."

Before the close of that same year (1831) Charles Darwin had sailed in the 'Beagle,' then bound on a surveying voyage, and he did not return to this country till October 2nd, 1836, having been away nearly five years.

There is no doubt that in the observations made during that voyage, and the reflections thereby occasioned, we may trace the germs of nearly all his later writings. It has therefore appeared to me desirable that the Entomological Notes, in his 'Journal of Researches,' which are, I am sorry to say, few and far between, should be put together collectively; and, bearing in mind that these observations were all made before the writer had attained the demure age of 28, this record of his youth can scarcely fail to interest those who are now regretting his death in his 74th year.

St. Paul's Rocks, a small islet which rises abruptly from the depths of the Atlantic, 540 miles from the coast of South America, was visited February 16th, 1832. The highest point is only fifty feet above the level of the sea, and the entire circumference is under three-quarters of a mile.

"Not a single plant, nor even a lichen grows on this islet; yet it is inhabited by several insects and spiders. The following list completes, I believe, the terrestrial fauna:—A fly (*Olfersia*) living on the booby, and a tick which must have come here as a parasite on the birds; a small brown moth belonging to a genus that feeds on feathers; a beetle (*Quedius*), and a woodlouse from beneath the dung; and lastly, numerous spiders, which, I suppose, prey on these small attendants and scavengers of the waterfowl.

"The often-repeated description of the stately palm and other noble tropical plants, their birds, and lastly, man, taking possession of the coral islets as soon as formed in the Pacific, is probably not quite correct; I fear it destroys the poetry of this story, that feather and dirt-feeding and parasitic insects and spiders should be the first inhabitants of newly-formed oceanic land."

Rio de Janeiro was visited April 4th, 1832, and, in making an excursion thence more than a hundred miles into the interior,

there was noticed "an intricate wilderness of lakes, in some of which were fresh, in others salt-water shells. Of the former kind I found a *Limnæa* in great numbers in a lake, into which the inhabitants assured me that the sea enters once a year, and sometimes oftener, and makes the water quite salt. I have no doubt many interesting facts, in relation to marine and fresh-water animals, might be observed in this chain of lagoons, which skirt the coast of Brazil. M. Gay has stated that he found, in the neighbourhood of Rio, shells of the marine genera *Solen* and *Mytilus* and fresh-water *Ampullariæ* living together in brackish water. I also frequently observed, in the lagoon near the Botanic Garden, where the water is only a little less salt than in the sea, a species of *Hydrophilus*, very similar to a water-beetle common in the ditches of England; in the same lake the only shell belonged to a genus generally found in estuaries."

Whilst staying at Rio, Mr. Darwin resided in a cottage at Botofogo Bay, close beneath the well-known mountain of the Corcovado. Here, "the climate during the months of May and June [1832], or at the beginning of winter, was delightful. The mean temperature . . . . was only 72°. It often rained heavily, but the drying southerly winds soon again rendered the walks pleasant. . . . . After the hotter days it was delicious to sit quietly in the garden and watch the evening pass into night. Nature, in these climes, chooses her vocalists from more humble performers than in Europe. A small frog, of the genus *Hyla*, sits on a blade of grass about an inch above the surface of the water, and sends forth a pleasing chirp; when several are together they sing in harmony on different notes. . . . Various *Cicadæ* and crickets at the same time keep up a ceaseless shrill cry, but which, softened by the distance, is not unpleasant. Every evening after dark this great concert commenced, and often have I sat listening to it, until my attention has been drawn away by some curious passing insect.

"At these times the fire-flies are seen flitting about from hedge to hedge. On a dark night the light can be seen at about two hundred paces distant. It is remarkable that in all the different kinds of glow-worms, shining Elaters, and various marine animals (such as the Crustacea, *Medusæ*, *Nereidæ*, a coralline of the genus *Clytia*, and *Pyrosoma*) which I have

observed, the light has been of a well-marked green colour. All the fire-flies which I caught here belonged to the *Lampyridæ* (in which family the English glow-worm is included), and the greater number of specimens were of *Lampyris occidentalis*. I found that this insect emitted the most brilliant flashes when irritated; in the intervals the abdominal rings were obscured. The flash was almost co-instantaneous in the two rings, but it was just perceptible first in the anterior one. The shining matter was fluid and very adhesive; little spots, where the skin had been torn, continued bright, with a slight scintillation, whilst the uninjured parts were obscured. When the insect was decapitated the rings remained uninterruptedly bright, but not so brilliant as before; local irritation with a needle always increased the vividness of the light. The rings in one instance retained their luminous property nearly twenty-four hours after the death of the insect. From these facts it would appear probable that the animal has only the power of concealing or extinguishing the light for short intervals, and that at other times the display is involuntary. On the muddy and wet gravel-walks I found the larvæ of this *Lampyris* in great numbers; they resembled in general form the female of the English glow-worm. These larvæ possessed but feeble luminous powers; very differently from their parents, on the slightest touch they feigned death, and ceased to shine; nor did irritation excite any fresh display. I kept several of them alive for some time: their tails are very singular organs, for they act, by a well-fitted contrivance, as suckers or organs of attachment, and likewise as reservoirs for saliva, or some such fluid. I repeatedly fed them on raw meat, and I invariably observed that every now and then the extremity of the tail was applied to the mouth, and a drop of fluid exuded on the meat, which was then in the act of being consumed. The tail, notwithstanding so much practice, does not seem to be able to find its way to the mouth; at least the neck was always touched first, and apparently as a guide.

"When we were at Bahia an *Elater* or beetle (*Pyrophorus luminosus*, Illig.) seemed the most common luminous insect. The light in this case was also rendered more brilliant by irritation. I amused myself one day by observing the springing powers of this insect, which have not, as it appears to me, been properly described. The *Elater*, when placed on its back and preparing

to spring, moved its head and thorax backwards, so that the pectoral spine was drawn out, and rested on the edge of its sheath. The same backward movement being continued, the spine, by the full action of the muscles, was bent like a spring; and the insect at this moment rested on the extremity of its head and wing-cases. The effort being suddenly relaxed, the head and thorax flew up, and in consequence the base of the wing-cases struck the supporting surface with such force that the insect, by the reaction, was jerked upwards to the height of one or two inches. The projecting points of the thorax and the sheath of the spine served to steady the whole body during the spring. In the descriptions which I have read sufficient stress does not appear to have been laid on the elasticity of the spine; so sudden a spring could not be the result of simple muscular contraction without the aid of some mechanical contrivance."

Whilst at Rio during the summer of 1832 a visit to the forest is thus mentioned :—" This day I found a specimen of a curious fungus called *Hymenophallus*. Most people know the English *Phallus*, which in autumn taints the air with its odious smell; this, however, as the entomologist is aware, is to some of our beetles a delightful fragrance. So was it here, for a *Strongylus*, attracted by the odour, alighted on the fungus as I carried it in my hand. We here see in two distant countries a similar relation between plants and insects of the same families, though the species of both are different. When man is the agent in introducing into a country a new species, this relation is often broken; as one instance of this I may mention that the leaves of the cabbages and lettuces, which in England afford food to such a multitude of slugs and caterpillars, in the gardens near Rio are untouched.

"During our stay at Brazil I made a large collection of insects. A few general observations on the comparative importance of the different orders may be interesting to the English entomologist. The large and brilliantly-coloured Lepidoptera bespeak the zone they inhabit far more plainly than any other race of animals. I allude only to the butterflies, for the moths, contrary to what might have been expected from the rankness of the vegetation, certainly appeared in much fewer numbers than in our own temperate regions. I was much surprised at the

habits of *Papilio feronia*. This butterfly is not uncommon, and generally frequents the orange-groves. Although a high flyer, yet it very frequently alights on the trunks of trees. On these occasions its head is invariably placed downwards, and its wings are expanded in a horizontal plane, instead of being folded vertically, as is commonly the case. This is the only butterfly which I have ever seen that uses its legs for running. Not being aware of this fact, the insect, more than once, as I cautiously approached with my forceps, shuffled on one side just as the instrument was on the point of closing, and thus escaped. But a far more singular fact is the power which this species possesses of making a noise. Several times when a pair, probably male and female, were chasing each other in an irregular course, they passed within a few yards of me, and I distinctly heard a clicking noise, similar to that produced by a toothed wheel passing under a spring catch. The noise was continued at short intervals, and could be distinguished at about twenty yards' distance. I am certain there is no error in the observation.*

"I was disappointed in the general aspect of the Coleoptera. The number of minute and obscurely-coloured beetles is exceedingly great. The cabinets of Europe can, as yet, boast only of the larger species from tropical climates. It is sufficient to disturb the composure of an entomologist's mind, to look forward to the future dimensions of a complete catalogue. (I may mention, as a common instance of one day's (June 23rd) collecting, when I was not attending particularly to the Coleoptera, that I caught sixty-eight species of that order. Among these there were only two of the *Carabidæ*, four *Brachelytra*, fifteen *Rhynchophora*, and fourteen of the *Chrysomelidæ*. Thirty-seven species of *Arachnidæ*, which I brought home, will be sufficient to prove that I was not paying overmuch attention to the generally favoured order of Coleoptera).

* In the Proceedings of this Society, March 3rd, 1845, Transations IV., cxxiii., we read:—"Mr. Edward Doubleday mentioned that he had recently examined *Peridromia Feronia*, the butterfly described by Mr. C. Darwin in his 'Tour,' as making a noise during flight like the rustling of parchment, and that he had detected a small membranous sac at the base of the fore-wings, with a structure along the subcostal nervure like an Archimedean screw or diaphragm in the tracheæ, especially at the dilated base of the wing."

"The carnivorous beetles, or *Carabidæ*, appear in extremely few numbers within the tropics: this is the more remarkable when compared to the case of the carnivorous quadrupeds, which are so abundant in hot countries. I was struck with this observation both on entering Brazil, and when I saw the many elegant and active forms of the *Harpalidæ* re-appearing on the temperate plains of La Plata. Do the very numerous spiders and rapacious Hymenoptera supply the place of the carnivorous beetles? The carrion-feeders and *Brachelytra* are very uncommon; on the other hand, the *Rhynchophora* and *Chrysomelidæ*, all of which depend on the vegetable world for subsistence, are present in astonishing numbers. I do not here refer to the number of different species, but to that of the individual insects; for on this it is that the most striking character in the entomology of different countries depends. The orders Orthoptera and Hemiptera are particularly numerous; as likewise is the stinging division of the Hymenoptera; the bees, perhaps, being excepted. A person, on first entering a tropical forest, is astonished at the labours of the ants; well-beaten paths branch off in every direction, on which an army of never-failing foragers may be seen, some going forth and others returning, burdened with pieces of green leaf, often larger than their own bodies.

"A small dark-coloured ant sometimes emigrates in countless numbers. One day, at Bahia, my attention was drawn by observing many spiders, cockroaches, and other insects, and some lizards, rushing in the greatest agitation across a bare piece of ground. A little way behind, every stalk and leaf was blackened by a small ant. The swarm having crossed the bare space, divided itself, and descended an old wall. By this means many insects were fairly enclosed; and the efforts which the poor little creatures made to extricate themselves from such a death were wonderful. When the ants came to the road they changed their course, and in narrow files re-ascended the wall. Having placed a small stone so as to intercept one of the lines, the whole body attacked it, and then immediately retired. Shortly afterwards another body came to the charge, and again, having failed to make any impression, this line of march was entirely given up. By going an inch round, the file might have avoided the stone, and this doubtless would have happened, if it

had been originally there: but having been attacked, the lion-hearted little warriors scorned the idea of yielding.

"Certain wasp-like insects, which construct in the corner of the verandahs clay cells for their larvæ, are very numerous in the neighbourhood of Rio. These cells they stuff full of half-dead spiders and caterpillars, which they seem wonderfully to know how to sting to that degree as to leave them paralysed but alive until their eggs are hatched, and the larvæ feed on the horrid mass of powerless, half-killed victims—a sight which has been described by an enthusiastic naturalist as curious and pleasing!

"I was much interested one day by watching a deadly contest between a *Pepsis* and a large spider of the genus *Lycosa*. The wasp made a sudden dash at its prey, and then flew away: the spider was evidently wounded, for, trying to escape, it rolled down a little slope, but had still strength sufficient to crawl into a thick tuft of grass. The wasp soon returned, and seemed surprised at not immediately finding its victim. It then commenced as regular a hunt as ever hound did after fox; making short semicircular casts, and all the time rapidly vibrating its wings and antennæ. The spider, though well concealed, was soon discovered; and the wasp, evidently still afraid of its adversary's jaws, after much manœuvring, inflicted two stings on the underside of its thorax. At last, carefully examining with its antennæ the now motionless spider, it proceeded to drag away the body. But I stopped both tyrant and prey."

On the 6th of December, 1833, the 'Beagle' left the Rio Plata for the coast of Patagonia, and the occurrence of insects at sea is chronicled thus:—

"Several times when the ship has been some miles off the Plata, and other times when off the shores of Northern Patagonia, we have been surrounded with insects. One evening, when we were about ten miles from the Bay of San Blas, vast numbers of butterflies, in bands or flocks of countless myriads, extended as far as the eye could range. Even by the aid of a telescope it was not possible to see a space free from butterflies. The seamen cried out, 'it was snowing butterflies,' and such in fact was the appearance. More species than one were present, but the main part belonged to a kind very similar to, but not

identical with, the common English *Colias Edusa*. Some moths and Hymenoptera accompanied the butterflies, and a fine beetle (*Calosoma*) flew on board. Other instances are known of this beetle having been caught far out at sea, and this is the more remarkable, as the greater number of the Carabidæ seldom or never take wing. The day had been fine and calm, and the one previous to it equally so, with light and variable airs. Hence we cannot suppose that the insects were blown off the land, but we must conclude that they voluntarily took flight. The great bands of the *Colias* seem at first to afford an instance like those on record of the migrations of another butterfly, *Vanessa cardui*; but the presence of other insects makes the case distinct, and even less intelligible. Before sunset a strong breeze sprung up from the north, and this must have caused tens of thousands of the butterflies and other insects to have perished.

"On another occasion, when seventeen miles off Cape Corrientes, I had a net overboard to catch pelagic animals. Upon drawing it up, to my surprise, I found a considerable number of beetles in it, and although in the open sea they did not appear much injured by the salt water. I lost some of the specimens, but those which I preserved belonged to the genera *Colymbetes*, *Hydroporus*, *Hydrobius* (two species), *Notaphus*, *Cynucus*, *Adimonia* and *Scarabæus*. At first I thought that these insects had been blown from the shore, but upon reflecting that out of the eight species four were aquatic, and two others partly so in their habits, it appeared to me most probable that they were floated into the sea by a small stream which drains a lake near Cape Corrientes. On any supposition it is an interesting circumstance to find live insects swimming in the open ocean seventeen miles from the nearest point of land. There are several accounts of insects having been blown off the Patagonian shore. Captain Cook observed it, as did more lately Captain King in the 'Adventure.' The cause probably is due to the want of shelter, both of trees and hills, so that an insect on the wing, with an off-shore breeze, would be very apt to be blown out to sea. The most remarkable instance I have known, of an insect being caught far from the land, was that of a large grasshopper (*Acridium*), which flew on board when the 'Beagle' was to windward of the Cape de Verd Islands, and when the nearest

point of land, not directly opposed to the trade-wind, was Cape Blanco, on the coast of Africa, 370 miles distant."

On the 23rd December, 1833, Port Desire, on the coast of Patagonia, was reached.

"The Zoology of Patagonia is as limited as its Flora. On the arid plains a few black beetles (*Heteromera*) might be seen slowly crawling about, and occasionally a lizard darted from side to side."

One hundred and ten miles further south the 'Beagle' entered the spacious harbour of Port St. Julian, Patagonia, on the 9th January, 1834.

"Although we could nowhere find, during our whole visit, a single drop of fresh water, yet some must exist; for by an odd chance I found on the surface of the salt water, near the head of the bay, a *Colymbetes*, not quite dead, which must have lived in some not far distant pool. Three other insects (a *Cicindela*, like *hybrida*, a *Cymindis*, and a *Harpalus*, which all live on muddy flats occasionally overflowed by the sea), and one other found dead on the plain, complete the list of the beetles. A good-sized fly (*Tabanus*) was extremely numerous, and tormented us by its painful bite. . . . We have here the puzzle that so frequently occurs in the case of mosquitoes—on the blood of what animals do these insects commonly feed? The guanaco is nearly the only warm-blooded quadruped, and it is found in quite inconsiderable numbers compared with the multitude of flies."

Two visits were paid to Tierra del Fuego; one from December, 1832 to February, 1833; and the other from February to June, 1834; the following remarks on the insects occur:—

"Beetles occur in very small numbers: it was long before I could believe that a country as large as Scotland, covered with vegetable productions and with a variety of stations, could be so unproductive. The few which I found were alpine species (*Harpalidæ* and *Heteromera*), living under stones. The vegetable-

feeding *Chrysomelidæ*, so eminently characteristic of the tropics, are here almost entirely absent. (I believe I must except one alpine *Haltica* and a single specimen of a *Melasoma*). Mr. Waterhouse informs me that of the *Harpalidæ* there are eight or nine species, the forms of the greater number being very peculiar; of *Heteromera*, four or five species; of *Rhynchophora*, six or seven: and of the following families one species in each: *Staphylinidæ*, *Elateridæ*, *Cebrionidæ*, *Melolonthidæ*. The species in the other orders are even fewer. In all the orders the scarcity of the individuals is even more remarkable than that of the species. Most of the Coleoptera have been carefully described by Mr. Waterhouse in the 'Annals of Natural History.' I saw very few flies, butterflies, or bees, and no crickets or Orthoptera. In the pools of water I found but few aquatic beetles. . . I have already contrasted the climate as well as the general appearance of Tierra del Fuego with that of Patagonia, and the difference is strongly exemplified in the Entomology. I do not think they have one species in common; certainly the general character of the insects is widely different."

In January, 1835, the Chonos Archipelago, on the western coast of South America, was visited.

"Cryptogamic plants here find a most congenial climate. In the Straits of Magellan, as I have before remarked, the country appears too cold and wet to allow of their arriving at perfection; but in these islands, within the forest, the number of species and great abundance of mosses, lichens, and small ferns is quite extraordinary.

"By sweeping with my insect-net, I procured from these situations a considerable number of minute insects, of the family *Staphylinidæ*, and others allied to *Pselaphus*, and minute Hymenoptera. But the most characteristic family in number, both of individuals and species, throughout the more open parts of Chiloe and Chonos, is that of the *Telephoridæ*."

March 11th, 1835, Valparaiso was reached, and from this point an excursion was made over the Cordillera to Mendoza, which was two days' journey on the eastern side of the mountains. On the 25th March, when approaching Mendoza, we read:—

"After our two days' tedious journey, it was refreshing to see in the distance the rows of poplars and willows growing round the village and river of Luxan. Shortly before we arrived at this place, we observed to the south a ragged cloud of a dark reddish-brown colour. At first we thought it was smoke from some great fire on the plains, but we soon found that it was a swarm of locusts. They were flying northward, and with the aid of a light breeze they overtook us at a rate of ten or fifteen miles an hour. The main body filled the air from a height of twenty feet, to that, as it appeared, of two or three thousand above the ground; 'and the sound of their wings was as the sound of chariots of many horses running to battle,' or rather, I should say, like a strong breeze passing through the rigging of a ship. The sky, seen through the advanced guard, appeared like a mezzotinto engraving, but the main body was impervious to sight; they were not, however, so thick together but that they could escape a stick waved backwards and forwards. When they alighted they were more numerous than the leaves in the field, and the surface became reddish instead of being green: the swarm having once alighted, the individuals flew from side to side in all directions. Locusts are not at all an uncommon pest in this country; already, during this season, several smaller swarms had come up from the south, where, as apparently in all other parts of the world, they are bred in the deserts. The poor cottagers in vain attempted by lighting fires, by shouts, and by waving branches, to avert the attack. This species of locust closely resembles, and perhaps is identical with, the famous *Gryllus migratorius* of the East." . . .

"We slept in the village of Luxan, which is a small place surrounded by gardens, and forms the most southern cultivated district in the province of Mendoza; it is five leagues south of the capital. At night I experienced an attack (for it deserves no less a name) of the *Benchuca*, a species of *Reduvius*, the great black bug of the Pampas. It is most disgusting to feel soft wingless insects, about an inch long, crawling over one's body. Before sucking they are quite thin, but afterwards they become round and bloated with blood, and in this state are easily crushed. One which I caught at Iquique (for they are found in Chili and Peru) was very empty. When placed on a table, and though surrounded by people, if a finger was presented, the bold

insect would immediately protrude its sucker, make a charge, and if allowed draw blood. No pain was caused by the wound. It was curious to watch its body during the act of sucking, as in less than ten minutes it changed from being as flat as a wafer to a globular form. This one feast, for which the benchuca was indebted to one of the officers, kept it fat during four whole months; but after the first fortnight it was quite ready to have another suck."

The Galapagos Archipelago was visited between September 15th and October 20th, 1835, and though directly under the equator it was remarked that both the fauna and flora were dull.

"With the exception of a wren with a fine yellow breast, and of a tyrant flycatcher with a scarlet tuft and breast, none of the birds are brilliantly coloured, as might have been expected in an equatorial district. Hence it would appear probable that the same causes which here make the immigrants of some species smaller, make most of the peculiar Galapageian species also smaller, as well as very generally more dusky coloured. All the plants have a wretched, weedy appearance, and I did not see one beautiful flower. The insects, again, are small-sized and dull-coloured, and, as Mr. Waterhouse informs me, there is nothing in their general appearance which would have led him to imagine that they had come from under the equator. The birds, plants, and insects have a desert character, and are not more brilliantly coloured than those from Southern Patagonia; we may, therefore, conclude that the usual gaudy colouring of the intertropical productions is not related either to the heat or light of those zones, but to some other cause, perhaps to the conditions of existence being generally favourable to life." . . . .

"I took great pains in collecting the insects, but, excepting Tierra del Fuego, I never saw in this respect so poor a country. Even in the upper and damp region I procured very few, excepting some minute Diptera and Hymenoptera, mostly of common mundane forms. As before remarked, the insects, for a tropical region, are of very small size and dull colours. Of beetles I collected twenty-five species (excluding a *Dermestes* and *Corynetes*, imported wherever a ship touches); of these, two belong to the *Harpalidæ*,

two to the *Hydrophilidæ*, nine to three families of the Heteromera, and the remaining twelve to as many different families. This circumstance of insects (and I may add plants) where few in number belonging to many different families, is, I believe, very general."

Mr. Waterhouse, who described these insects from the Galapagos Islands in the 'Annals and Magazine of Nat. Hist.,' 1845, vol. xvi., pp. 19—41, remarks:—"The insects here described are nearly all of small size, and none of them display any brilliant colouring. Some of the species are referable to a little group found in Chili and Peru,—the genus *Ammophorus*,—a genus hitherto only found in those parts; others appertain to a genus (*Anchonus*) which is almost confined to the West Indian Islands and the northern parts of South America. Again, in the collection under consideration are species of genera which are found all over the world, or nearly so, such as *Feronia*, *Notaphus*, and *Oryctes;* and lastly, there are species which cannot be located in any known *genus*, but which appertain to *families* having representatives in most parts of the world, such as the *Pedinidæ*, *Tentyriidæ*, *Anthrobidæ*, and *Halticidæ*. . . . . Some of the insects of the collection have labels attached, from which may be ascertained the particular island of the Galapagos Group from which they were procured, and where this was the case I have not found any species which is common to two or more of the islands."

On the 19th January, 1836, Mr. Darwin, then in New South Wales, was approaching Bathurst:—"I was interested by finding here the hollow conical pit-fall of the ant-lion, or some other insect: first a fly fell down the treacherous slope and immediately disappeared; then came a large but unwary ant, its struggles to escape being very violent; those curious little jets of sand, described by Kirby and Spence as being flirted by the insect's tail, were promptly directed against the expected victim. But the ant enjoyed a better fate than the fly, and escaped the fatal jaws which lay concealed at the base of the conical hollow. The Australian pit-fall was only about half the size of that made by the European ant-lion."

April 1st to 12th, 1836, was spent at the Keeling or Cocos

Islands, in the Indian Ocean, about 600 miles distant from the coast of Sumatra.

"Of insects I took pains to collect every kind. Exclusive of spiders, which were numerous, there were thirteen species, belonging to the following orders:—In the Coleoptera, a minute *Elater*; Orthoptera, a *Gryllus* and a *Blatta*; Hemiptera, one species; Homoptera, two; Neuroptera, a *Chrysopa*; Hymenoptera, two ants; Lepidoptera, a *Diopæa*, and a *Pterophorus* (?); Diptera, two species. A small ant swarmed by thousands under the loose dry blocks of coral, and was the only true insect which was abundant."

On the advantages to the naturalist of extended travel, the closing words of the 'Journal of Researches into the Natural History and Geology of the countries visited during the voyage of H. M. S. "Beagle" round the World' should be deeply impressed on the minds of all who may, if not now, yet in after-life, have opportunities of putting them in practice.

"In conclusion, it appears to me that nothing can be more improving to a young naturalist than a journey in distant countries. It both sharpens and partly allays that want and craving which, as Sir John Herschel remarks, a man experiences, although every corporeal sense be fully satisfied. The excitement from the novelty of objects and the chance of success stimulate him to increased activity. Moreover, as a number of isolated facts soon become uninteresting, the habit of comparison leads to generalisation. On the other hand, as the traveller stays but a short time in each place, his descriptions must generally consist of mere sketches, instead of detailed observations. Hence arises, as I have found to my cost, a constant tendency to fill up the wide gaps of knowledge by inaccurate and superficial hypotheses.

"But I have too deeply enjoyed the voyage not to recommend any naturalist, although he must not expect to be so fortunate in his companions as I have been, to take all chances, and to start on travels by land if possible, if otherwise on a long voyage. He may feel assured he will meet with no difficulties or dangers, excepting in rare cases, nearly so bad as he beforehand anticipates.

In a moral point of view the effect ought to be to teach him good-humoured patience, freedom from selfishness, the habit of acting for himself, and of making the best of every occurrence; in short, he ought to partake of the characteristic qualities of most sailors. Travelling ought also to teach him distrust; but at the same time he will discover how many truly kind-hearted people there are with whom he never before had, or ever again will have, any further communication, who yet are ready to offer him the most disinterested assistance."

A few words in conclusion with reference to the tendency, now perhaps decaying but scarcely yet extinct among us, of describing species from insufficient materials. In turning over the pages of any of the older authors one cannot fail to notice that points which were much overlooked by them are these :—1st, the range of variation of a species in specimens from a single locality; and 2nd, the range of variation of a species in a series of widely separated localities.

To take the case of a travelled entomologist, who had never even left Europe, yet if he collected the same insect in twenty different localities from St. Petersburg to Lisbon he would thus learn more of its multitudinous phases than by any amount of cabinet-hunting.

In the course of my life I have described many species from single specimens, but I now look back upon such conduct as the follies of my younger days, for, if you have only a single specimen before you, your knowledge of its range of variation is literally *nil*; and who knows whether the solitary specimen you have before you is an extreme variation on the one side or on the other, or whether it represents the normal character of the species?

Probably it would be a good plan to restrain our describing ardour—this *furor describendi*—till we have before us, at least, from twenty to thirty specimens of the species. We should thereby avoid many errors, and also much lessen the labours of posterity, who will often fail in the attempts to decipher our unsatisfactory descriptions. I can imagine that it may be urged that if A abstains from describing because he feels he lacks a sufficiency of material, B, who is not restrained by any such conscientiousness, will rush to the front and attain *priority*;

well, all I should say in such a case is this, if B likes to make a fool of himself, let him; A is not in any way injured thereby.

The nuisance of describing from unique specimens has been brought home to me very forcibly by my being asked over and over again by my continental correspondents to supply them with specimens of all the species I have ever described from single specimens; it seems uncourteous not to satisfy their expectations, yet at the same time the thing is physically impossible, as by far the greater number of these unique specimens, on which I founded species, still remain unique, and are not in my own collection.

Perhaps, if a species has not been regularly established within a period of say forty or fifty years from its first description, it would be a safe plan to look upon it as *non est*, and to omit it from our lists. Should it ever turn up in plenty it can always be resuscitated.

In vacating the chair, I must congratulate the Society that it has elected as my successor Mr. Dunning, one who has not been guilty of my youthful follies of founding a score of species on single specimens; the contributions that Mr. Dunning has from time to time made to the literature of Entomology have all been conceived in a truly philosophical spirit, and I trust we may yet see many more from his pen.

I have now only to thank the Society for the kindness with which my numerous shortcomings have been excused during the past two years.

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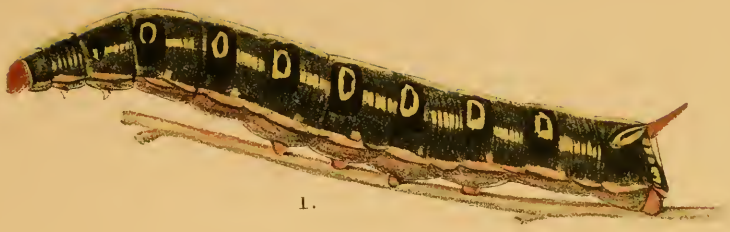

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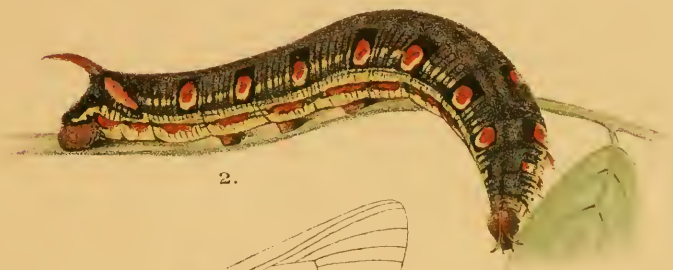

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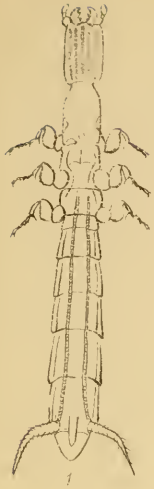
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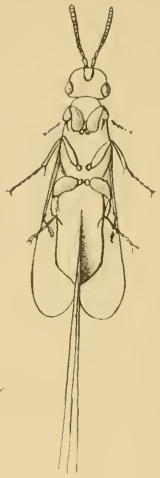
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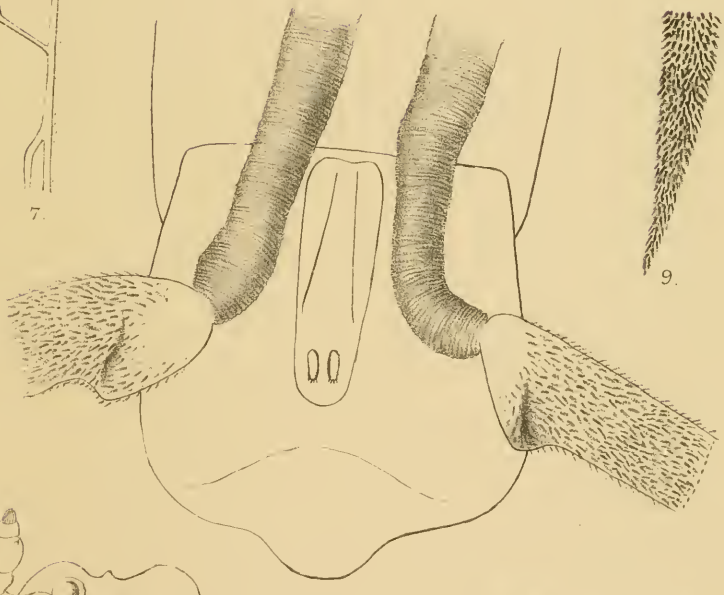
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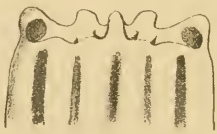
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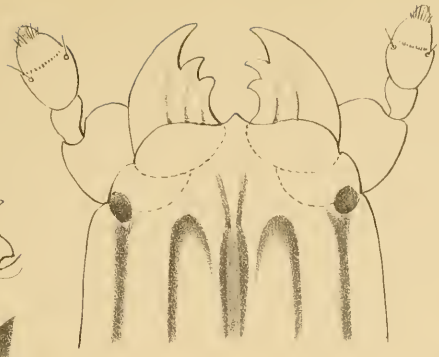
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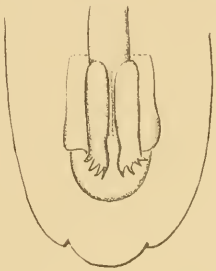
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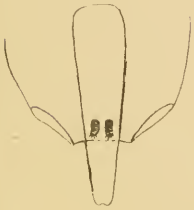
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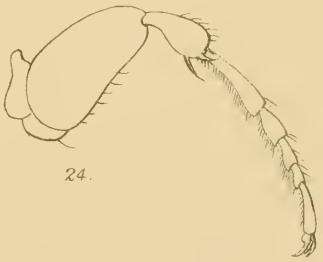
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Sycophaga crassipes, Westw.

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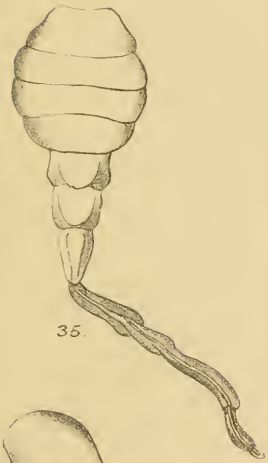
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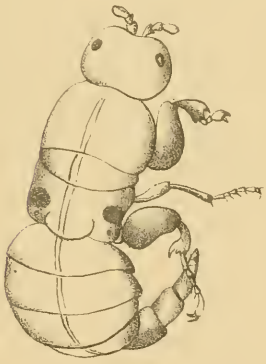
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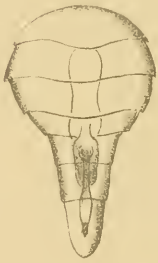
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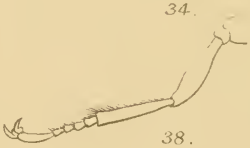
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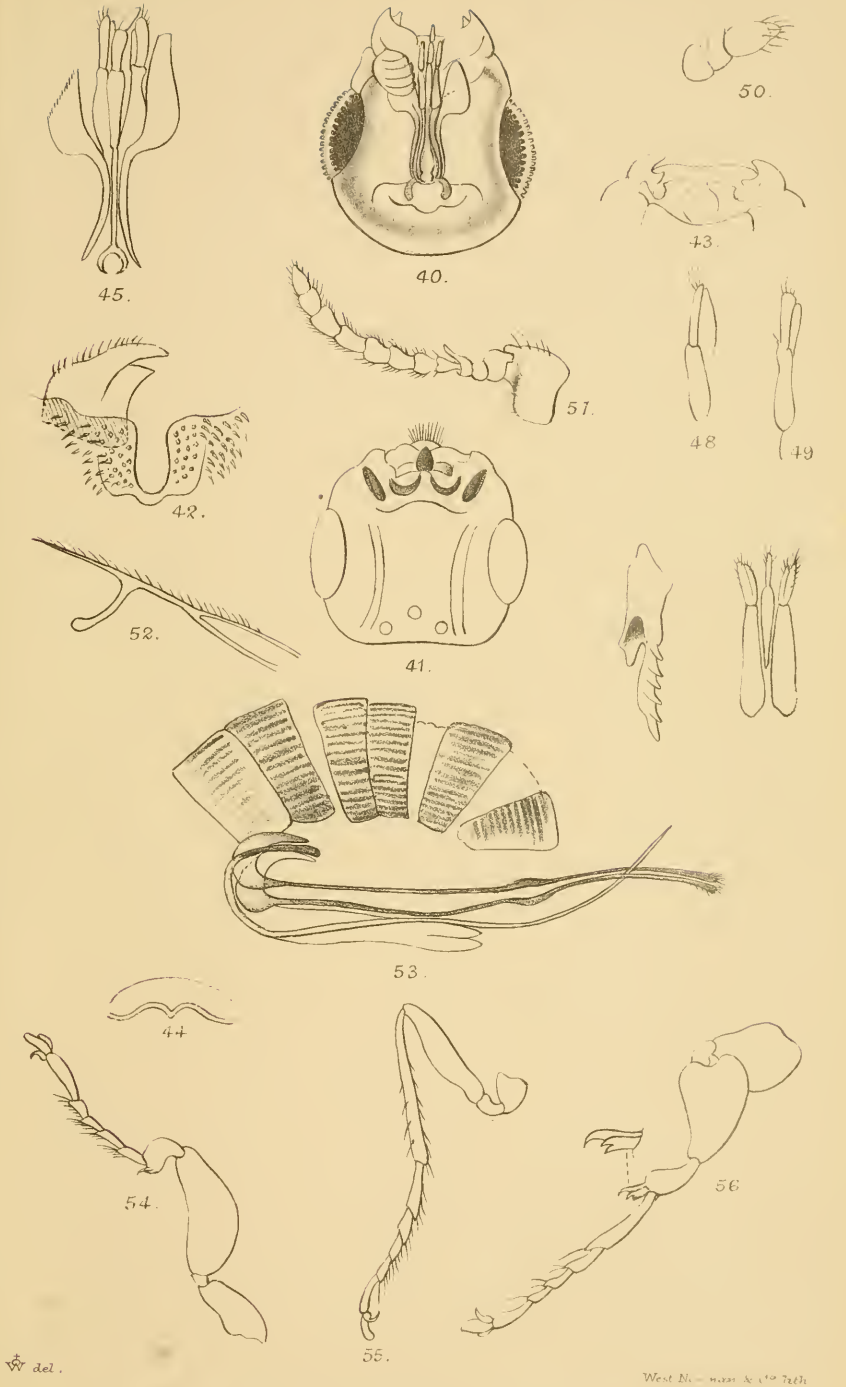
Blastophaga Psenes, L.



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Blastophaga Psenes, L.

7th and 8th ventral plates of Prosopis

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Male genital armature &c of British Hymenoptera

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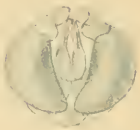
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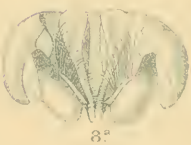
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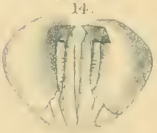
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Male genital armature &c. of British Lymexylonidæ.

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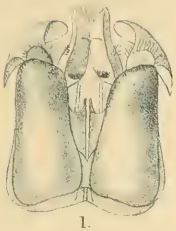
Male genital armature &c of British Hymenoptera



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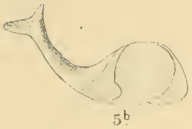

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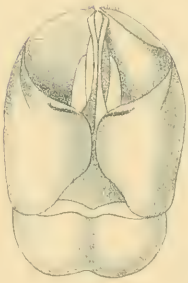

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C.S Saunders del

Mintern Bros. imp

Male genital armature &c. of British Hymenoptera

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C S Saunders del

Mintern Bros imp

Male genital armature &c. of British Hymenoptera

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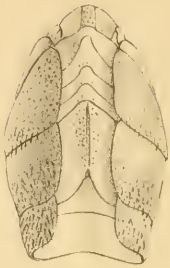
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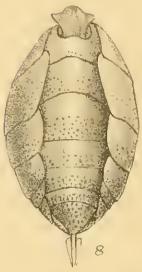
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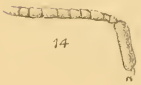
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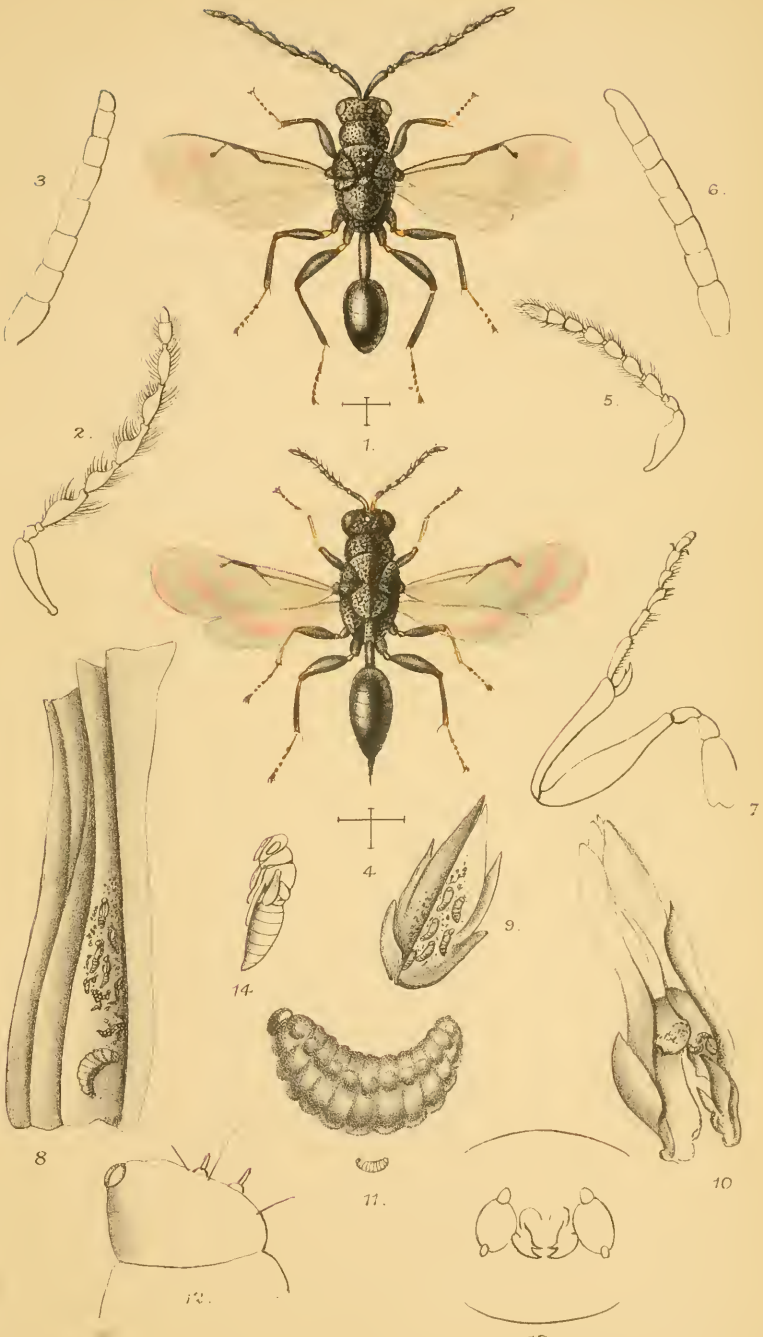

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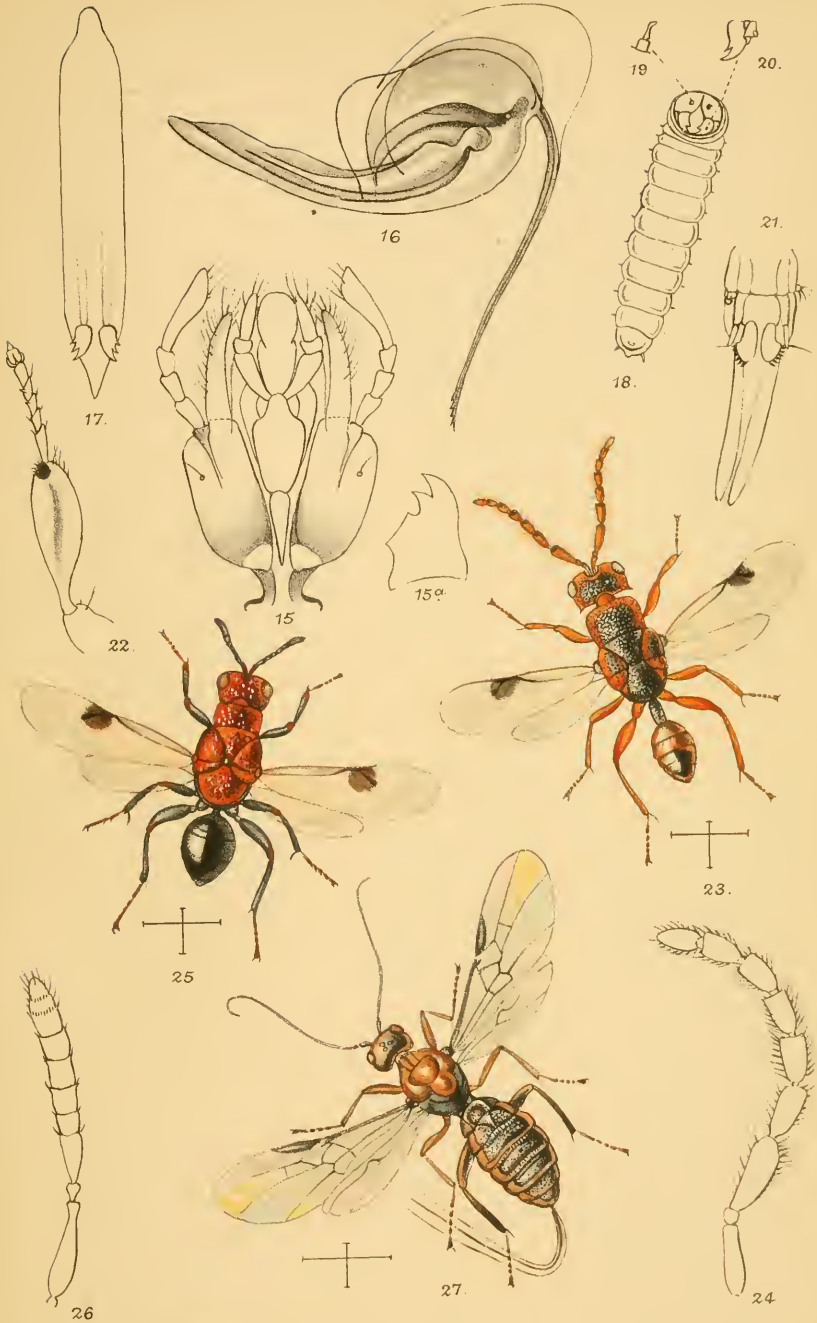

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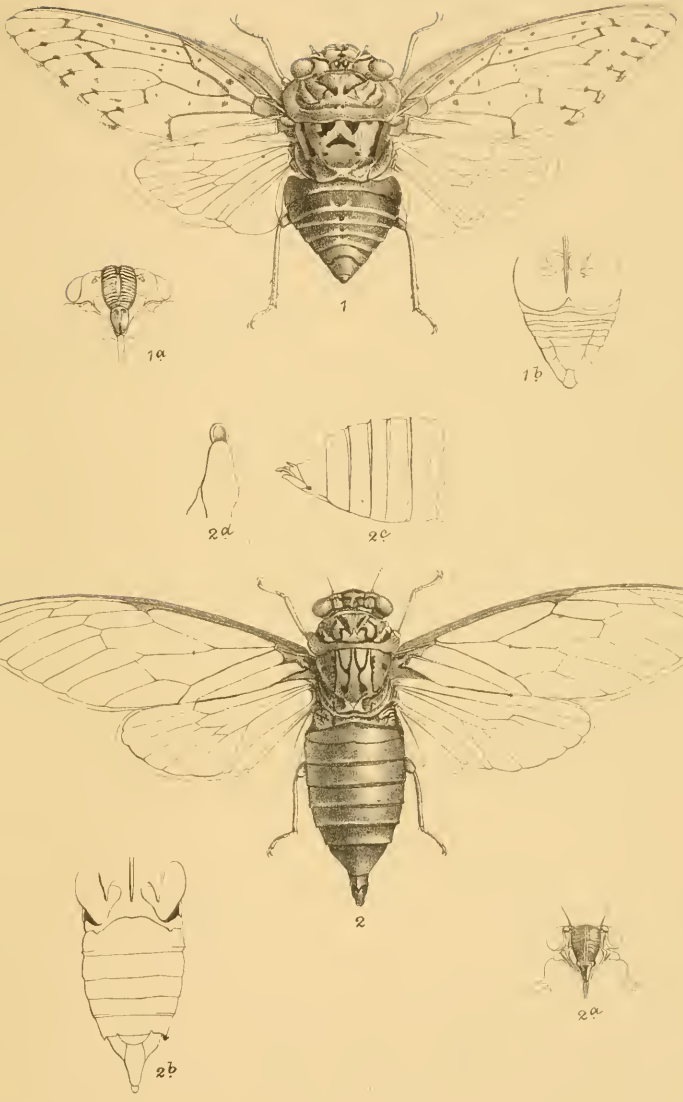
West Newman & Co lith.

Eurytoma Taprobanica, Westw.,&c.



Edwin Wilson del et lith.

West, Newman & Co. imp.

Cicadidæ from Madagascar.

1.

6

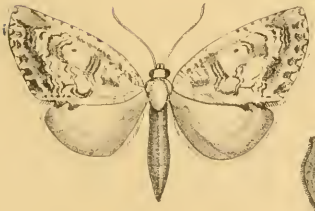
7.

2.

8

9.

3.



10.

11.

4.

12.

13.

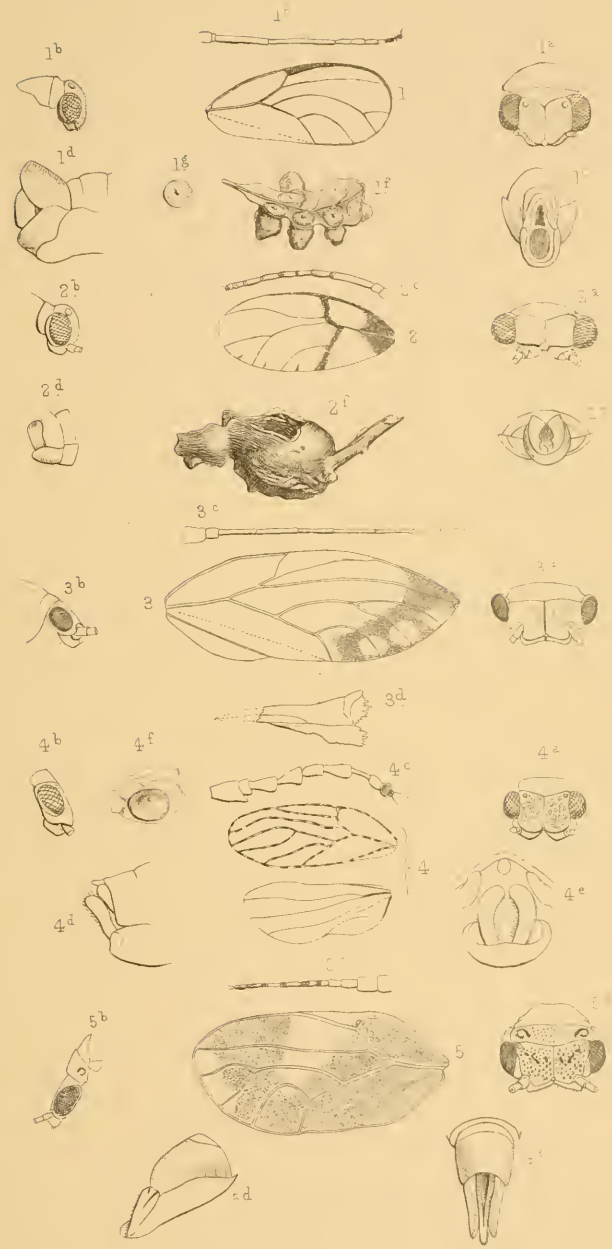
5.

Edwin Wilson, del et lith

Mintern Bros imp

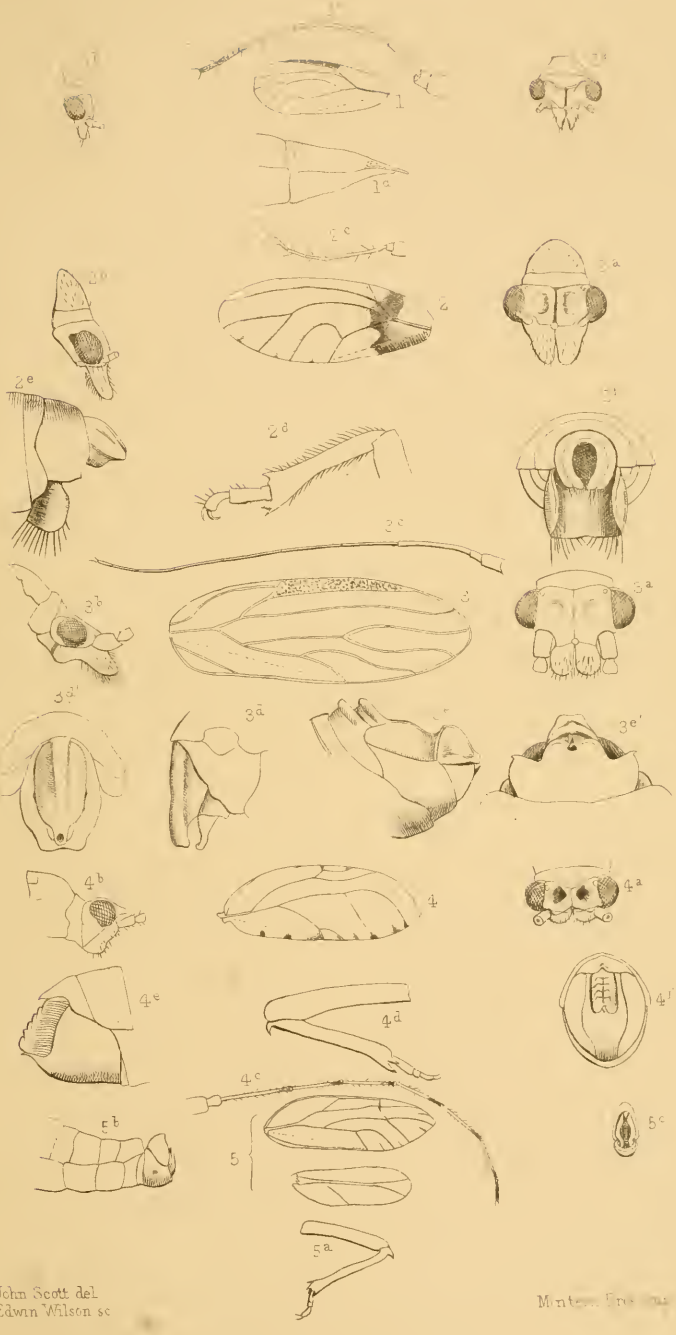
Geometrites of Chili.

1a
4.
5
8
14



John Scott del
Edwin Wilson sc

Details of Psyllidæ



John Scott del.
Edwin Wilson sc

Details of Psyllidæ

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